TOPICS IN PĀLI HISTORICAL PHONOLOGY

Indira Yashwant Junghare

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This book is an account of the phonological development of the Pali language from Sanskrit times, which incorporates the latest developments in linguistic scholarship. Within the framework of generative phonology, it deals with a number of interesting aspects concerning sound changes. It examines the underlying forms, the bases for their postulation, readjustment rules, phonological rules, their order with respect to each other and with respect to the rules in other set. The study separates synchronic rules from historical processes, inherited rules from innovated rules, and generalized rules from particularized rules. Furthermore, it discusses restructuring and global constraint, and suggests some phonological universals on the basis of Pali assimilatory processes.

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INDIRA YASHWANT JUNGHARE,
M.A., Ph.D.

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DEDICATED TO

My Mother, Husband and Daughter

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I wish to express my sincere thanks and deep gratitude to Dr. Edgar C. Polomè, Chairman of the Department of African and Oriental Languages and Literatures for his meticulous guidance and for his constant willingness to help me academically and otherwise throughout my stay at the University of Texas at Austin. Thanks are also due to Doctors Sumitra Katre, Robert D. King, and Herman H. Van Olphen for their valuable suggestions. I also want to thank Dr. Eugene Grace, an Assistant Professor at Northeastern Illinois State College, for the time he generously spent in reading the earlier drafts.

November 14, 1978

Indira Y. Junghare

FOREWORD

The problems of early Indo-Aryan phonology have been an important concern of generative phonology in the last fifteen years. A central issue was the problems of rule ordering involved in the synchronic and diachronic operation of Grassmann's Law and the application of Bartholomae's Law. The successive analyses of Zwicky (1965), Kiparsky (1965), and Anderson (1970) ran into a number of difficulties, and the debate is still going on in a number of recent articles mainly in *Linguistic Inquiry* (e.g., Sag [1974, 1976], Phelps [1975], Schindler [1976], etc.). Similarly, the so-called *ruki*-rule (retroflexion of *s* triggered by following *r*, *u*, *k* or *i*) has been the object of lively discussion in view of the difficulty of considering the conditioning segments of the retroflexion rule as members of one "natural class" (cf., e. g., Zwicky [1970], Vennemann [1974], etc.). As a consequence, those aspects of Sanskrit phonology often found their way into the current handbooks: thus, S. Anderson deals extensively (pp. 44-47 and 203-208) with Grassmann's Law in *The Organization of Phonology* (New York; Academic Press, 1974). Middle Indic, on the contrary, is widely neglected, and it is therefore a most welcome initiative that Dr. Indira Junghare has taken to provide us with the first synchronic and diachronic phonological analysis of Pāli, using the methods of generative phonology. The results that she obtained speak for themselves: they prove that the generative approach provides a better insight into the process of language change; they throw a new light on some complex problems of Pāli phonology, as for example the phonetic quality of Pāli resonants plus *h*; they provide a model for further work on Middle Indic phonology, which is so badly needed if we want to understand the full scope of the development of Indo-Aryan until the present time.

But the work of Dr. Junghare is not only timely—it is a work of great patience and industry, based on carefully checked data, exhaustively discussed with leading scholars like Professor

S. Katre, and thoroughly analyzed and elaborated in the generative framework under the guidance of Professor R. King. Relevance to modern Indo-Aryan, problems of grammatical structure and development were also reviewed with Professor H. van Olphen. As for myself, I can only say that I found working with Dr. Junghare during the preparation of this volume one of the most exciting and challenging experiences of my career.

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CHAPTER I

INTRODUCTION

Pāli is an archaic Prakrit, a middle Indian language which is a descendant of one of the Old Indo-Aryan languages. It is very closely related to both Vedic and Sanskrit, although by no means identical with either one of them.

It is of interest to know what happens to a language in the process of its development. Every language, extinct or living, is important to a linguist. A linguist formulates hypotheses about phonological, morphological, and syntactic universals. Since he wishes these universals to be valid for all periods of human language, he tries to test them on the basis of the study of both living and extinct languages.

The Purpose and Scope

The purpose of this research is :

(1) to present a synchronic description of Pāli phonology;
(2) to compare it with a synchronic description of Skt. phonology; and
(3) to see their implications for the theory of historical phonology, morphology, and morphophonology.

Pāli is the language of Buddhistic philosophy, one of the greatest philosophies in the world. It is recorded in the literature of four periods; (1) the language of the Gāthās, the metrical pieces, which has a very heterogeneous character and contains many archaic forms; (2) the language of the canonical prose, which is more homogeneous than the language of the Gāthās; (3) the language of post-canonical literature; and (4) the language of later artificial poetry having no homogeneous character. In this work, no separate phonological descriptions are presented for the language of these stages. Instead, the phonological presentation given here suffices for their description since they are not too dissimilar. Occasionally, I have taken the liberty to "standardize" the language.

Pāli is thought to be an artificial language, a mixture of various dialects. However, the dialectical differences are not

so great as to require separate descriptions. The differences can be expressed in terms of the presence or absence of a few low-level rules.

Origin of Pāli

There are several opinions regarding the origin of Pāli, both geographic and genetic. The most popular opinion is that Pāli is Māgadhī, the language of Bihār where Buddhism arose. Buddhistic tradition claims that *Pāli-Tipiṭaka* is composed in the language of Buddha; hence, Māgadhī is also called Mūla-bhāṣā, the basic language. Burnouf and Lassen (1826) have, however, refuted this opinion on the grounds that some phonological features of Māgadhī are not found in Pāli. For example, every Skt. *r* is changed to *l* in Māgadhī, but *r* is changed to *l* only sporadically in Pāli. Also, the depalatalization of *ś*, which is present in Pāli, is absent in Māgadhī. Finally, in Māgadhī, the masc. and neut. nouns ending in *a*, as well as consonants, take the nom. sg. suffix *e*. In the same noun stems of Pāli, the nom. sg. suffixes of masc. and neut. nouns are *o* and *am*, respectively.

Some linguists, such as Kuhn (1875) and Franke (1902), have considered Pāli to be the dialect of Ujjayini since it stands closest to the language of the Aśoka-inscriptions of Girnar and since the dialect of Ujjayini is said to have been the mother-tongue of Mahinda who preached Buddhism in Ceylon. Hence, the Vindhya region has been considered to be the home of Pāli; but linguists Oldenberg (1879) and Müller (1884) consider the Kalinga country to be the home of Pāli. Their conclusion is based on the argument that the oldest settlement in Ceylon could have been founded by the people of Kalinga, the area on the mainland opposite Ceylon, rather than by people from Bengāl and Bihār.

Pāli has been considered as ArdhaMāgadhī because there are similarities between Pāli and Ārṣa (ArdhaMāgadhī) phonologies and morphologies, and because ArdhaMāgadhī differs from Māgadhī exactly on the same points as Pāli.

Bloch (1965) views the conflict and the linguistic evidence behind it and concludes that it is impossible to localize any Middle Indic language. The location of inscriptions is no clue; for example, Middle Indic inscriptions are found in areas which

are Dravidian today and probably have always been Dravidian. Nor is linguistic evidence fruitful. Every Middle Indic language has forms which are not regular in that language but reflect regular phonological processes in other Middle Indic languages. An example is the use of *-o* for the nom. pl. and *-e* for the accusative plural of consonant stems in Pāli. The first is the regular Pāli descendant of the Old Indic suffix *-as*; the second is the regular Māgadhī descendant of the same Old Indic suffix. Writers freely borrowed forms from other languages to make distinctions they felt were useful even when the distinctions existed neither in the source language nor in the recipient language. But, by and large, correspondences between Pāli and Old Indic are regular, and we may safely conclude that Pāli is very close to a Middle Indic language spoken somewhere in the Indian cultural area but artificially modified in a few respects on the basis of other Middle Indic languages and Classical Sanskrit.

Feature System

A good feature system should describe the phonological processes found in languages in the most natural way. It should also be capable of serving as a basis for universal phonology.

The feature systems used in a generative phonology are of two types: (1) feature systems based on acoustic and articulatory phenomena. For example, the systems of Jakobson and Halle, McCawley, and Chomsky and Halle. (2) Feature systems independent of phonetics, for example, the feature system of Foley.

Each feature system should make a claim about language which is testable. All feature systems can be tested by examining how well they handle phonological phenomena in languages which have not been used in defining them. Because of the present state of our knowledge of phonology all feature systems will fail such a test if they are viewed as closed systems. But no system is indeed to be a closed system. Hence, it is not proper to test the particulars of a feature system, but rather the principle on which it is based. Feature systems based on articulatory and acoustic phenomena can be disproven if natural phonological processes are found which are not or only poorly

describable in terms of these systems. These feature systems make a claim about natural languages, namely that phonological processes are acoustically or articulatorily based. On the other hand, Foley's system is based entirely on phonological processes and hence is open to revision whenever new phonological processes are discovered; as such it makes no claim about natural languages and it is not testable. For this reason, I have decided to use a system of features which have acoustic, and articulatory correlates.

The feature system that I have chosen to use is basically McCawley's revision of the system of Jakobson and Halle (1956) used in *Fundamentals of Language*. I have omitted some of McCawley's features which are of limited applicability: for example, retracted articulator, which seldom describes necessary distinctions which cannot be stated in terms of the feature flat; abrupt offset, which seldom describes necessary distinctions which cannot be stated in terms of the feature strident; and lateral, which is useful only in describing distinctions involving dental or alveolar affricates and fricatives in a few languages. (Since languages which distinguish nonlateral affricates and fricatives from lateral affricates and fricatives generally do not have retroflex affricates and fricatives and since lateralization causes a slight lowering of the second formant, lateral affricates and fricatives can be considered to be flat alveolars and fricatives.)

Following are the features used in the description of Pāli.

1. *Consonantal/non-consonantal* : an obstruction is necessary in the production of consonantal sounds, whereas non-consonantal sounds need no such obstruction (Chomsky & Halle, 1968, p. 302).

Acoustically, consonantal sounds have low total energy and non-consonantal sounds have high total energy. Stops, fricatives, liquids, and nasals are consonantal; glides and vowels are non-consonantal.

2. *Obstruent/sonorant* : obstruents are produced with a cavity configuration that makes spontaneous voicing impossible, whereas a vocal tract cavity configuration of sonorants allows spontaneous voicing (Chomsky & Halle, 1968, p. 302).

Acoustically, obstruents are characterized by very low sonority, whereas sonorants are characterized by moderate or high

sonority. Stops, affricates and fricatives are obstruents; nasals, liquids, glides, and vowels are sonorants.

3. *Resonant/non-resonant*: a resonant is a segment with moderate sonority; a non-resonant is one with high or low sonority. A resonant is a vowel which has a non-syllabic alternant, or consonant which has a syllabic alternant.

Obstruents and low and mid vowels are non-resonants; nasals, liquids, glides and high-vowels are resonants. Resonant segments form a natural class; non-resonant segments do not form a natural class. Because of this the metatheory must exclude the use of -res in a phonological rule.

4. *Syllabic/non-syllabic* : the syllabic segments have high sonority, non-syllabic segments have low sonority. Stops, fricatives, liquids, glides, and nasals are non-syllabic; vowels, syllabic liquids and nasals are syllabic.

Chart of Sonority

cons.	obs.	stops		non-syllabic
		affricates		
		fricatives		
non-cons	son.	nasals	resonant	
		liquids		
		glides		
		syllabic nasals		syllabic
		syllabic liquids		
		high vowels		
		mid vowels		
		low vowels		

5. *Nasal/oral* : in the production of nasal sounds the air passes through the nasal cavity since they are produced with a lowered velum. Oral sounds are produced with a raised velum, and the air passes only through the mouth. Acoustically, in the production of nasal sounds, one extra (nasal) formant is involved, which comes between the first and the second formant if the first formant is low, or below the first formant if the first formant is high. Oral sounds are characterized by the lack of an extra formant. Nasal consonants and nasalized vowels are nasal. Non-nasal consonants and oral vowels are oral.

6. *Continuant/interrupted* : interrupted sounds are distinguished from continuants by the rapid turning on or off of source either through a rapid closure and/or opening of the vocal tract. Acoustically, the onset of a continuant sound is gradual as opposed to the abrupt onset of an interrupted sound. In the production of interrupted sounds, silence (at least in frequency range above vocal cord vibration) is followed and/or preceded by spread of energy over a wide frequency region, whereas in the production of continuants there is an absence of abrupt transition between sound and such a silence (Jakobson and Halle, 1956, p. 30).

Vowels, glides and fricatives are continuant; stops, affricates and nasals are interrupted. Nasals are considered interrupted articulatorily because the passage of air through the mouth is stopped during their production even though air is allowed to continue to pass through the nose. But the main reason for considering nasals as interrupted is the fact that they usually pattern with stops in natural languages; that is, a language would not be expected to have an *m* unless it has *p* or *b*, or *n* unless it has *t* or *d*, etc. Since laterals are usually found in the same region as acute stops in natural language, they can be considered to be interrupted liquids. On the other hand, *r* like sounds often do not correlate with stops. In this sense, *r* like sounds are like fricatives. Polish has three voiceless fricatives and three voiced fricatives which are acute, but only two voiceless stops and two voiced stops which are acute. In Castilian Spanish, *s* and *r* are slightly post-alveolar, whereas, *t*, *d*, *n*, and *l* are pre-alveolar. Hence, *r* like sounds can be considered to be continuant liquids. Ross found reasons in the phonological rules of German to consider *r* to be continuant and *l* to be interrupted. In Pāli, *r* is closer to *y* and *w* than is *l*. See the prefix vowel nasalization rule.

7. *High/low* : in the production of high sounds, the body of the tongue is raised above the neutral position, whereas in the production of low sounds, the body of the tongue is allowed to rest in a position below the neutral position, usually at the bottom of the mouth. Neutral position is the position of mid vowels and is not a rest position.

Acoustically, the first formant is low in the production of high sounds; it is high in the production of low sounds. Velars,

palatals, alveopalatals, and high vowels are high; labials, dentals, retroflexes, and low vowels are low.

Because of the existence of mid vowels in many languages a strict dichotomy between high and low cannot universally be maintained for vowels. Hence, both features may be used in describing vowels. High vowels are +high, −low; mid vowels are −high, −low, and low vowels are −high, +low.

In general, only one of the two features should be used in describing consonants; those consonants which are being +high are automatically −low and those consonants which are being -high are automatically +low. Post velar consonants, however, tend to correlate acoustically, articulatorily and functionally with mid vowels. For example, in Quechua, mid vowels appear only in the vicinity of uvulars. In old English, a mid vowel is inserted after certain vowels before *h*. Perhaps, these sounds should be described as −high, −low as our mid vowels.

8. *Grave/acute* : sounds pronounced in front of the dental region or behind the palatal region are grave; those pronounced between the dental and palatal region are acute. Acoustically, the second formant is low in the production of grave sounds, whereas it is high in the production of acute sounds. Back and central vowels, peripheral (labial, velar and post velar) consonants are grave; front vowels and central (dental, alveolar, alveopalatal and palatal) consonants are acute.

9. *Flat/plain* : flat sounds are produced by reducing the lip orifice (rounding), holding the tongue in a vertical position or contracting the pharyngeal tract, increasing the volume of the oral cavity (Jakobson, Fant and Halle, 1967, p. 31).

Acoustically, in the production of flat sounds, the second formant is lowered; but in the case of plain the second formant is neither lowered nor raised.

Rounded segments and retroflex, uvular, pharyngealized and velarized consonants are flat; everything else is plain.

10. *Sharp/plain* : sharp consonants are produced by raising a part of the tongue against the palate thus reducing the oral cavity. Plain consonants are produced without raising a part of the tongue.

Acoustically, the second formant is raised in the production of sharp sounds; it is neither raised nor lowered in the production of plain sounds.

Palatalized consonants are sharp; everything else is plain. +sharp and at the same time +flat, $\left[\begin{smallmatrix}+\text{shp}\\+\text{flt}\end{smallmatrix}\right]$ is not acoustically recognizable since the two processes cancel each other. But it is recognizable articulatorily in segments which are both palatalized and rounded.

11. *Strident/mellow* : strident segments are characterized by supplementary obstruction creating edge effect at the point of articulation. Mellow sounds are characterized by less complex impediments (Jakobson and Halle, 1956, p. 31). Acoustically, strident sounds are characterized by high intensity noise, mellow sounds by lower intensity noise.

Stops and vowels are always mellow. The glide *y* in some dialects of Spanish is strident. Fricatives and affricates in the following positions—labio-dental, alveolar, retroflex, alveo-palatal, and uvular—are strident. Fricatives in the following position—bilabial, dental, palatal and velar—are mellow. Mellow affricates are very rare and may be considered strident because they involve higher intensity noise than do stops.

12. *Voiced/voiceless* : voiced sounds are produced by periodic vibrations of the vocal cords while voiceless sounds lack such vibrations.

Acoustically, voiced and voiceless sounds are distinguished from each other by presence vs. absence of periodic low frequency excitation (Jakobson and Halle, 1956, p. 30). Vowels, liquids, glides, nasals, and consonants whose onset and offset are voiced are +vcd; consonants with either voiceless onset or voiceless offset are −vcd.

13. *Tense/lax* : tense sounds are produced with a deliberate, accurate, maximally distinct gesture that involves considerable effort of the super glottal muscle; lax sounds involve no such effort. They are produced rapidly and somewhat indistinctly (Chomsky and Halle, 1968, p. 324).

Acoustically, tense segments are characterized by a higher total amount of energy in conjunction with a greater spread of the energy in the spectrum and in time. Lax segments are characterized by a lower total amount of energy in conjunction with a smaller spread of the energy in the spectrum and in time.

Consonants usually considered voiceless and tense vowels are tense; consonants usually considered voiced and lax vowels

are lax or −tense. Tense consonants may not be +vcd.

14. *Heightened subglottal pressure/normal subglottal pressure* : segments with heightened subglottal pressure are characterized by the tenseness in the subglottal cavities; segments with normal subglottal pressure are characterized by the absence of such tenseness. Acoustically, heightened subglottal pressure is reflected in high frequency noise; normal subglottal pressure is characterized by the absence of such noise. Normally, tenseness in the subglottal cavities is accompanied by tenseness of the supraglottal muscles; however, the Indic voiced aspirated stops are characterized by subglottal tenseness and superglottal laxness. Heightened subglottal pressure is realized as aspiration if the glottis is unconstricted; it is realized as glottalization if the glottis is constricted.

Aspirated and glottalized consonants are +H.S.P.; unaspirated, unglottalized consonants and vowels are −H.S.P.

15. *Long/short* : the sounds of language can be distinguished from one another not only by qualitative differences but also by their duration (extension in time) or length. Thus, the feature 'long' is used to handle contrasts which are primarily quantitative. All sounds, with the exception of stops, may be prolonged as long as the pulmonary air allows. And the stops themselves are capable of a certain lengthening, since the closing can be prolonged within certain limits (Malmberg, 1963, p. 74). Indian languages (Skt., Pāli, Hindi, etc.) make considerable use of quantitative differences, even in unstressed syllables. In the Germanic languages, quantitative vocalic differences are, most often, accompanied by important qualitative differences (English: seat: sit, pool-pull). The short vowels are at the same time more open and more lax. The prosodic opposition long vs. short (distinguishing either simple from sustained or simple from reduced phonemes) is based on the relative, not absolute, length of the phonemes in the given sequence (Jakobson, Fant, and Halle, 1967, p. 14). It is significant, then, that a long *ū* be longer than a short *u* before the same consonant. But 'short' *a* may have the same duration or even longer than a 'long' *u*. This kind of perceived and conscious quantity is of linguistic importance. "It is to this quantity that one refers when one speaks in linguistics of shorts and longs." (Malmberg, 1963, p. 76).

In Pāli, the distinction long vs. short is phonemic only in the case of vowels, but not in the case of consonants. However, geminate consonants are redundantly long.

16. *Checked/unchecked* : checked segments are characterized by a higher rate of discharge of energy within reduced interval of time. Unchecked segments are characterized by a lower rate of discharge of energy within a longer interval of time. Glottalized consonants are checked. All other sounds are unchecked. Checked consonants are usually −voiced, +tense, +H.S.P.

The following is the Feature Matrix of Pāli :

Distinctive Feature Matrix of Pāli

	p	ph	b	bh	t	th	d	dh	ṭ	ṭh	ḍ	ḍh	c	ch	j	jh	k	kh	g	gh	s	ś	m	n	r	l	y	w	h	a	ā	i	ī	u	ū	e	o
cons.	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	-	-	-	-	-	-	-	-	-	-	-
obs.	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	-	-	-	-											
syl.																											-	-	-	+	+	+	+	+	+	+	+	+
nas.																							+	+	-	-											
cont.	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	+	+			+	-											
high.	-	-	-	-	-	-	-	-	-	-	-	-	+	+	+	+	+	+	+	+							+	+	-	-	-	+	+	+	+	-	-
low.																													+	+						-	-
grv.	+	+	+	+	-	-	-	-	-	-	-	-	-	-	-	-	+	+	+	+			+	-			-	+				-	-	+	+	-	+
flt.					-	-	-	-	+	+	+	+																									
vcd.	-	-	+	+	-	-	+	+	-	-	+	+	-	-	+	+	-	-	+	+																	
H.S.P.	-	+	-	+	-	+	-	+	-	+	-	+	-	+	-	+	-	+	-	+																	
lng.																													-	+	-	+	-	+			

Global Constraint

Pāli has several rules that create geminates. They fall into two groups. Generally, resonants assimilate progressively and obstruents regressively. All these rules produce geminates in unnatural positions, initially and after a consonant. Pāli reduces all geminates in all unnatural positions. In cases where a consonant is divided into two parts by a syllabic boundary, we speak of a geminate consonant. A geminate may be defined as a succession or a cluster of two identical consonants. As it seems to be a natural phenomena that no language allows geminates in unnatural position, especially initially and we would expect that Pāli at any stage of its history did not allow geminates in unnatural position. We also know that the progressive assimilation processes are earlier than regressive. This is because the prefix *ud*, which is an exception to progressive, undergoes regressive assimilation. In Vedic, *ud* was a separate word, but in Pāli, it is a prefix. The reduction of geminates in unnatural position has to take place after regressive assimilation in order to reduce unnatural geminates; but we cannot say that geminate simplification was a later process than either progressive or regressive assimilation. That would imply that between the time when progressive assimilation took place and the time when regressive assimilation took place, Pāli speakers pronounced geminates in unnatural positions. Geminate reduction is clearly not a rule that can either exist or not exist in grammar. It must be stated as some sort of a condition in all the languages. It should be a part of the metatheory. Such a condition can be stated in two ways: either an output constraint or global constraint. Stating it as an output constraint would mean geminate in unnatural position would be allowed to be carried through derivations until the output at which point all languages will reduce them. This doesn't work in Pāli. There is one rule in Pāli which affects geminates created by an earlier rule, the change of *vv* to *bb*. This rule must occur after geminate reduction. The *vv* created by the assimilation rule in unnatural position results in surface *v* and not surface *b*. It seems that geminates in unnatural position not only may not appear in the surface, but also may not be treated as geminates by any phonological rule. This idea is best expressed by global constraint. All geminates occurring in initial position or after

a consonant are reduced as soon as they are created. The following examples will give some idea about the rules and their relationship with the global constraint.

Some derivations :

	(1) wyāḍa 'snake'
Retroflex Later.	wyāḷa
y Assim.	wwāḷa
Fric. of w	vvāḷa
Gem. Red. (Glob. Const.)	vāḷa

	(2) veti 'goes away'/	eti 'goes'
	wi+e+ti	e+ti
Glide Form.	wy+e+ti	—
y Assim.	ww+e+ti	—
Fric. of w	vv+e+ti	—
Gem. Red. (Glob. Const.)	v+e+ti	—
	veti	*eti*

	(3) diū+ya+ti 'plays'
Glide Form.	diw+ya+ti
y Assim.	diw+wa+ti
Fric. of w	div+va+ti
Gem. Red. (Glob. Cons.)	—
Occlus. of Fric.	dib+ba+ti
	dibbati

	(4) vajati 'proceeds'	anubbajati 'goes along'
	wraj+a+ti	anu+wraj+a+ti
r Assim.	wwaj+a+ti	anu+wwaj+a+ti
Fric. of w	vvaj+a+ti	anu+vvaj+a+ti
Gem. Red. (Glob. Cons.)	vaj+a+ti	—
Occlus. of Fric.	—	anu+bbaj+a+ti
	vajati	*anubbajati*

The global constraint which reduces geminates initially and after a consonant can be justified physiologically. Even though it is possible to produce geminates initially they cannot be heard. A geminate can be heard only when it is preceded by a vowel. Geminates are heard as a delay between onset and offset. Onsets are heard only when vowels precede them.

The constraint existed in Skt. root: majjn, nom. sg. majjā, inst. sg. majñā.

CHAPTER II

II READJUSTMENT AND PHONOLOGICAL RULES AND THEIR ORDER

The following are two sets of rules: (1) Readjustment rules and (2) Phonological rules. Generally, readjustment rules precede phonological rules. Therefore they are presented in that order.

Readjustment Rules

1. *Guṇa and Vṛddhi.*

A. *Regular Guṇa and Vṛddhi* : The vowel *a* is inserted before a resonant which is followed by an obstruent in a root marked for Guṇa, while the vowel *ā* is inserted in a root marked for Vṛddhi.

$$\begin{array}{cccc} X & R & (+obs) &] \\ 1 & 2 & 3 & \end{array} \longrightarrow \begin{array}{cccc} 1 & \left\{\begin{array}{c} a \\ \bar{a} \end{array}\right\} & 2 & 3 \\ & 1\ \ 1 & & \end{array}$$

Root

$$\begin{bmatrix} +\text{Guṇa} \\ +\text{Vṛddhi} \end{bmatrix}$$

1 1

in certain cases, tenses and derivative formations.

The terms Guṇa and Vṛddhi here are not used in their usual sense. They are together used as a name of the rule which inserts the vowels *a* and *ā*, respectively, before a resonant. Traditionally, the accented high grade syllables *e*, *o*, *ar*, *al* constitute the fundamental stage called Guṇa by the native grammarians. These syllables interchange with the unaccented low grade vowels *i*, *u*, *ṛ*, *ḷ*, respectively. The syllables *ai*, *au*, *ār*, *āl*, which may be regarded as a lengthened variety of the Guṇa syllables, are called Vṛddhi.

This rule accounts for the following alternations.

1. bhavati (3rd. sg. pres.) 'is'
   bhūta (pple.)
2. hoti (3rd. sg. pres.) 'is'
   hūta (pple.)

3. cavati (3rd. sg. pres.) 'moves'
   cuta (pple.)
4. cāveti (caus. 3rd. sg. pres.) 'brings to fall'
   cāvita (pple.)
5. nayati/neti (caus. 3rd. sg. pres.) 'leads'
   nīta (pple.)
6. eti (3rd. sg. pres.) 'goes'
   ita (pple.)
7. rājānaṃ (acc. sg.) 'king'
   raññā (inst. sg.) (rājn+ā)

Some derivations :

	(1)	bhū+a+ti
Regular Guṇa		bhaū+a+ti
Glide Form.		bhaw+a+ti
Fric. of w		bhav+a+ti
		bhavati

For the application of this rule, roots have to be marked in the lexicon; for example, the root *cu* is marked for the Guṇa rule in the present tense, active conjugation, but, marked for Vṛddhi in the causative formation. The derivation of the causative 3rd. sg. pres. will be the following :

	(2)	cu +aya+ti
Regular Vṛddhi		cāu +aya+ti
Glide Form.		cāw +aya+ti
Coales. of Gl. with Vowels		cāw +e +ti
Fric. of w		cāv +e +ti
		cāveti

B. *Samprasāraṇa Guṇa and Vṛddhi*: The vowel *a* is inserted after a resonant which is followed by an obstruent in a root marked for Samprasāraṇa Guṇa; roots marked for Samprasāraṇa Vṛddhi will insert *ā* in the same phonological environment instead. The same root may be marked for Samprasāraṇa Guṇa in one tense and Vṛddhi in another tense or derivative formation.

$$X \quad R(+obs)\big] \longrightarrow 1 \quad 2 \quad \begin{bmatrix} a \\ \bar{a} \end{bmatrix}_{1} \quad 3$$

1 2 3 Root

$$\begin{bmatrix} +\text{Samprasāraṇa Guṇa} \\ +\text{Samprasāraṇa Vṛddhi} \end{bmatrix}_{1}$$

in certain cases, tenses and derivative formations

Again, the terms Samprasāraṇa, Guṇa and Vṛddhi together are the names for the rules which insert the vowels *a* and *ā* respectively, after resonants. Traditionally, the accented high grade syllables *ya*, *va*, *ra*, called Samprasāraṇa Guṇa interchange with the unaccented low grade vowels *i*, *u*, *r*. Similarly the long syllables *yā*, *vā*, *rā* called Samprasāraṇa Vṛddhi, may be regarded as a lengthened variety of the Samprasāraṇa Guṇa syllables.

Examples :

1.	vasati	(3rd. sg. pres.) 'clothes'
	vuttha	(pple.)
2.	vapati	(3rd. sg. pres.) 'sows'
	vutta	(pple.)
3.	vatti	(3rd. sg. pres.) 'says'
	vutta	(pple.)
4.	vāceti	(caus. 3rd. sg. pres.) 'teaches'
	vācita	(pple.)
5.	cāveti	(caus. 3rd. sg. pres.) 'brings to fall'
	cāvita	(pple.)

Some derivations :

	(1)		
		us+a+ti	us+ta
Sampr. Guṇa		uas+a+ti	—
Glide Insertion		—	wus+ta
Glide Form.		was+a+ti	—
s-Soften.		—	wuh+ta
Metathesis		—	wut+ha
Fric. of w		vas+a+ti	vut+ha
h-Assim.		—	vut+tha
		vasati	*vuttha*

	(2)		
		cu+aya+ti	cu+ta
Sampr. Vṛddhi		cāu+aya+ti	cāu+ta
Set i Insert.		—	cāu+ita
Glide Form.		cāw+aya+ti	cāw+ita
Coales. of Gl. with Vowels		cāw+e +ti	—
Fric. of w		cāv+e +ti	cāv+ita
		cāveti	*cāvita*

2. *Glide Insertion* : The glide *w* is inserted initially if the verb root begins with the vowel *ū* followed by a consonant; *y* is inserted if the root begins with *ī* followed by a consonant.

$$\phi \longrightarrow \begin{bmatrix} -\text{cns} \\ -\text{syl} \\ \alpha\text{grv} \\ +\text{high} \end{bmatrix} \Big/ \begin{bmatrix} \text{—} \end{bmatrix} \begin{bmatrix} -\text{cns} \\ +\text{syl} \\ +\text{high} \\ \alpha\text{grv} \end{bmatrix} \text{C}$$

Verb root

Examples :

1.	vatti	'says'	vutta (pple.)
2.	vapati	'sows'	vutta (pple.)
3.	vasati	'clothes'	vuttha (pple.)
4.	yajati	'sacrifices'	yiṭṭha (root ij)

Some derivations:

(1) uc+ta

Glide Insertion — wuc+ta
Fric. of w — vuc+ta
Cons. Assim. — vut+ta

vutta

(2) up+ta

Glide Insertion — wup+ta
Fric. of w — vup+ta
Cons. Assim. — vut+ta

vutta

(3) us+ta

Glide Insertion — wus+ta
s-Soften. — wuh+ta
Metathesis — wut+ha
Fric. of w — vut+ha
h-Assim. — vut+tha

vuttha

This rule must follow the Samprasāraṇa Guṇa and Vṛddhi

rule, otherwise we get the wrong surface form. See the following derivation :

	ij+a+ti
Glide Insertion	yij+a+ti
Sampr. Guṇa	yiaj+a+ti
Glide Form.	yyaj+a+ti
	**yyajati*

Following is the right derivation :

	ij+a+ti
Sampr. Guṇa	iaj+a+ti
Glide Insertion	—

This rule does not apply because *i* is not followed by a *C*.

Glide Form.	yaj+a+ti
	yajati

3. *Vowel Lengthening* : The high vowels *i* and *u* become long before the passive suffix *y*.

$$\begin{bmatrix} -\text{cns} \\ +\text{syl} \\ +\text{high} \end{bmatrix} \longrightarrow [+\text{lng}] \,/\, \underline{\quad} \; [\text{y}$$

Passive suffix

Examples :

1. suṇoti (3rd. sg. pres.) 'hears' sūyati (3rd. sg. pass.)
   suta (pple.)
2. neti (3rd. sg. pres.) 'leads' nīyati (3rd. sg. pass.)
   nīta (pple.)
3. dadāti (3rd. sg. pres.) 'gives' dīyati (3rd. sg. pass.)
   dinna (pple.)

Note : Guṇation regularly does not occur in the passive.

4. *Laryngeal Coalescence*: The low vowel *a* and the high vowel *i* merge to form *ā* in a few roots that had laryngeals in P.I.E.

$$\begin{bmatrix} -\text{cns} \\ +\text{syl} \\ +\text{low} \end{bmatrix}_1 \quad \begin{Bmatrix} -\text{cns} \\ +\text{syl} \\ +\text{high} \\ -\text{grv} \end{Bmatrix}_2 \Longrightarrow \overset{1}{[+\text{lng}]} \quad \overset{2}{}$$

Laryngeal Coalescence is a minor rule. Lexical items have to be marked for its application. This rule must follow the Guṇa rule since the Guṇa rule provides its input :

	a+ṭṭhi+si	ṭṭhi+ta
Guṇa	a+ṭṭhai+si	—
Laryng. Coales.	a+ṭṭhā+si	—
Gem. Red.	—	ṭhi+ta
	aṭṭhāsi	*ṭhi̊ta*

Examples :

1. di (root) 'give' dadāti (3rd. sg. pres.)
   dīyati (pass.)
2. pī (root) 'drink' pātabba (gerundive)
   pīta (pple.)
3. ṭṭhi (root) 'stand' aṭṭhāsi (aorist)
   ṭhita (pple.)

5. *Svarabhakti* : The vowels *a* and *u* are inserted after two consonants or a single consonant when followed by a non-obstruent consonant which is followed by a suffix beginning with vowel in noun stems marked for *a* and *u* insertion respectively.

$$\phi \longrightarrow \left\{ \begin{bmatrix} -\text{cns} \\ +\text{syl} \\ +\text{low} \end{bmatrix}_1 \quad \begin{Bmatrix} -\text{cns} \\ +\text{syl} \\ +\text{high} \\ +\text{grv} \end{Bmatrix}_1 \right\} \Big/ \langle \text{C} \rangle \quad \text{C} \text{——} \left[\begin{matrix} +\text{cns} \\ -\text{obs} \\ \langle +\text{nas} \rangle \end{matrix} \right] \quad \text{V}$$

Noun stem

$$\begin{Bmatrix} +\text{a-insertion} \\ +\text{u-insertion} \end{Bmatrix}_1$$

Examples :

1. Root: pitr (+a-ins.) gen. sg. pit*a*ro

2. Root: attn (+a-ins.) gen. sg. att*a*no

3. Root: brahmn gen. sg. brahm*u*no

But pitr+hi ⟶ pitṛ+hi ⟶ pitūhi because *hi* begins with *C* (C is defined as $\begin{Bmatrix}+\text{cns}\\-\text{voc}\end{Bmatrix}$). This rule must follow the Guṇa and Vṛddhi rule, otherwise we would have:

	pitr+am (acc. sg.)
Svarabhakti	pitar+am
Regular Guṇa	pitaar+am
Like Vowel Coales.	pitār+am
	**pitāram*

6. *Drop of Nasals and Liquids in Nom. Sg.*: A nasal or liquid is dropped with compensatory lengthening in the nominative singular.

$$\underset{1}{V}\quad\underset{2}{\begin{bmatrix}+\text{cns}\\-\text{obs}\end{bmatrix}}\quad+\quad\begin{bmatrix}\phi\\ \text{Nom. sg.}\end{bmatrix}\quad\underset{\text{l}}{}$$

$$\underset{1}{}\quad\underset{2}{}\quad 3\Longrightarrow\quad[+\text{lng}]$$

Examples :

1.	pitā (nom. sg.)	'father'	pitaro	(nom. pl.)
2.	rājā (nom. sg.)	'king'	rājāno	(nom. pl.)
3.	sā (nom. sg.)	'dog'	suṇā	(abl. inst. sg.)
			sunaṃ	(acc. sg.)

Some derivations :

	(1)	(2)
	pitr+ϕ	rājn + ϕ
Regular Guṇa	pitar+ϕ	rājan+ ϕ
Drop of Nas. & Liq.	pitā +ϕ	rājā + ϕ
	pitā	*rājā*

This rule must follow the Guṇa and Vṛddhi rule since the latter provides the $\begin{Bmatrix}a\\ā\end{Bmatrix}$ which is necessary for its application.

	sun (nom. sg.)	sun+o (nom. pl)	sun+ā (inst. & abl. sg.)
Guṇa & Vṛddhi	suan	suān+o	—
Drop of Nas.	suā	—	—
Glide Form.	swā	swān+o	—
n-Retroflex.	—	—	suṇ+ā
w-Assim.	ssā	ssān+o	—
Gem. Red.	sā	sān+o	—
	sā	*sāno*	*suṇā*

Lengthening in the nom. sg. in *n*, *r*, and *s* stems is widespread in Indo-European. It is found also, for example, in Latin :

nom. sg.	arbōs	gen. sg.	arboris
nom. sg.	virgō	gen. sg.	virginis

7. *Reduplication*:

A. *Intensive* :

C (R) (a) (R) Obs
〈+high〉

1 2 3 4 5 ⟹ 1 ā 4+1 2 3 4 5

$$\left[\begin{array}{l} -\text{H.S.P.} \\ -\text{flt} \\ \left\langle \begin{array}{l} -\text{grv} \\ +\text{str} \end{array} \right\rangle \end{array}\right]$$

Examples:

1. kam (root) 'take steps' caṅkamati (intens.)
2. gam (root) 'go' jaṅgamati (intens.)
3. muh (root) 'lose control over one's mind' momuhati (intens.)
4. lap (root) 'talk' lālappati (intens.)

Derivations :

(1) kram+a +ti

Redupl.	cām+kram+a+ti
r-Assim.	cām+kkam+a+ti
Gem. Red.	cām+kam +a+ti
Nas. Assim.	cāṅ+kam +a+ti
Vowel Short.	caṅ+kam +a+ti
	caṅkamati

(2) lap+a+ti
Redupl. lā+lap+y+a+ti
(This verb forms its intensive with y.)
y-Assim. lā+lapp+a+ti
lālappati

(3) muh+a+ti
Redupl. māu+muh+a+ti
Mid Vowel Form. mo+muh+a+ti
momuhati

(4) gam+a+ti
Redupl. jām+gam+a+ti
Nasal Assim. jāṅ+gam+a+ti
Vowel Short. jaṅ+gam+a+ti
jaṅgamati

B. *Desiderative* :

$$\left[\begin{matrix} C \\ \langle +\text{high} \rangle \end{matrix}\right] \text{Root} \quad 1 \Longrightarrow 1 \quad \left\{\begin{matrix} i \\ u \\ a \end{matrix}\right\} \quad 1$$

$$\left[+\text{des.} \right] \qquad \left[\begin{matrix} -\text{H.S.P.} \\ -\text{flt} \\ \left\langle \begin{matrix} -\text{grv} \\ +\text{str} \end{matrix} \right\rangle \end{matrix} \right]$$

In the formation of desiderative, the reduplicating syllable generally contains the vowel *i*; but in some cases *u*, and in some cases *a* are also found. It is difficult to predict which one of these vowels will occur since there is no set distributional pattern. The verbs which do not take *i* in the reduplication syllable of their desiderative but take either *u* or *a* have to be marked in the lexicon.

Examples :

1. jigucchati (des.) gup (root) 'dislike'
2. jighacchati (des.) ghas (root) 'eat'

3. titikkhati (des.) tij (root) 'tolerate'
4. vavakkhati (des.) uc (root) 'speak'
5. sussūsati (des.) sru (root) 'hear'
6. cikicchati (des.) cit (root) 'hesitate'
7. icchati (des.) īp (root) 'desire to reach or possess'

Some derivations :

(1) īp+s+a+ti
Assim. of Front Cons. īts+s+a+ti
s-Soften. īt^{s}+h+a+ti
Pal. of Affr. īc+h+a+ti
h-Assim. īc+ch+a+ti
Vowel Short. ic+ch+a+ti
icchati

(2) gup+s+a+ti
Redupl. ji+gup+s+a+ti
Assim. of Front Cons. ji+guts+s+a+ti
s-Soften. ji+guts+h+a+ti
Pal. of Affr. ji+guc+h+a+ti
h-Assim. ji+guc+ch+a+ti
jigucchati

(3) ghas+s+a+ti
Redupl. ji+ghas+s+a+ti
s-Dissim. ji+ghat+s+a+ti
Assim. of Front Cons. ji+ghat^{s}+s+a+ti
s-Soften. ji+ghat^{s}+h+a+ti
Pal. of Affr. ji+ghac+h+a+ti
h-Assim. ji+ghac+ch+a+ti
jighacchati

(4) sru+s+a+ti
Redupl. su+sru+s+a+ti
r-Assim. su+ssu+s+a+ti
Irreg. Vowel Length. su+ssū+s+a+ti
sussūsati

(5) tij+s+a+ti
Redupl. ti+tij+s+a+ti

Rev. of Pal. —A	ti + tig + s + a + ti
Voice Assim.	ti + tik + s + a + ti
s-Soften.	ti + tik + h + a + ti
h-Assim.	ti + tik + kh + a + ti
	titikkhati

C. Present—1.

$$\begin{bmatrix} C & V & (C) \\ \langle +\text{high} \rangle & & \\ 1 & 2 & 3 \end{bmatrix} \Longrightarrow 1 \quad \begin{Bmatrix} i \\ a \end{Bmatrix} \quad 1 \quad 3$$

Root

$$\begin{bmatrix} +\text{Redupl.} \\ \text{class—1} \end{bmatrix} \qquad \begin{bmatrix} -\text{H.S.P.} \\ -\text{flt} \\ \langle -\text{grv} \\ +\text{str} \rangle \end{bmatrix}$$

The reduplicating syllable generally contains *i*, but in some cases *a*. It is almost impossible to make any definite statement regarding their occurrence. Those verbs which take *a* have to be marked.

Examples :

1. tiṭhati (3rd. sg. pres.) ṭhi (root) 'stand'
2. jahati (3rd. sg. pres.) hā (root) 'abandon'
3. pibati (3rd. sg. pres.) pi (root) 'drink'
4. sīdati (3rd. sg. pres.) sad (root) 'sink.'

Derivations :

	(1) ṭṭhi+a+ti	(2) sad+a+ti
Gem. Red.	ṭhi+a+ti	—
Redupl.	ti+ṭh+a+ti	si+sd+a+ti
Drop of s	—	sī+d+a+ti
	tiṭhati	*sīdati*

	(3) jhā+a+ti	(4) pi+a+ti
Redupl.	ja+jh+a+ti	pi+p+a+ti
Weak.of Vcd.Asp.	ja+h+a+ti	—

Intervocalic voic.
only in √pi —— pi+b+a+ti

jahati *pibati* / pivati

D. Present-2

$$\begin{bmatrix} C \\ \langle +\text{high} \rangle \end{bmatrix}_{\text{Root}} \quad 1 \quad \Longrightarrow \quad 1 \quad \begin{Bmatrix} i \\ u \\ a \end{Bmatrix} \quad 1$$

$$\begin{bmatrix} +\text{Redupl.} \\ \text{class-2} \end{bmatrix} \qquad \begin{bmatrix} -\text{H.S.P.} \\ -\text{flt} \\ \left\langle \begin{matrix} -\text{grv} \\ +\text{str} \end{matrix} \right\rangle \end{bmatrix}$$

Again, the environment does not predict the occurrence of a particular vowel in the reduplicating syllable of Present-2. The verbs which are marked for *u* will take *u*, and those marked for *a* will take *a*.

Examples :

1. dadāti (3rd. sg. pres.) di (root) 'give'
2. juhoti (3rd. sg. pres.) jhu (root) 'sacrifice'
3. juvhati (3rd. sg. pres.) jhu (root) 'sacrifice'
4. icchati (3rd. sg. pres.) īp (root) 'wish'

Derivations :

(1) di+a+ti

Regular Guṇa dai+a+ti

Laryng. Coales. dā+a+ti

Redupl. da+dā+a+ti

Like Vowel Coales. da+dā+ti

dadāti

(2) jhu+a+ti

Regular Guṇa jhau+a+ti

Redupl. ju+jhau+a+ti

Glide Form. ju+jhaw+a+ti

Weak. of Vcd. Asp.	ju+haw+a+ti
Coales. of Gl. with Vowels	ju+ho+ti
	juhoti

Without Guṇa :

	(3) jhu+a+ti
Redupl.	ju+jhu+a+ti
Glide Form.	ju+jhw+a+ti
Weak. of Vcd. Asp.	ju+hw+a+ti
Fric. of w	ju+hv+a+ti
Metathesis	ju+vh+a+ti
	juvhati

8. *Theme Vowel Lengthening* : The theme vowel *a* is lengthened before personal suffixes which begin with *m*.

$$\begin{bmatrix} -\text{cns} \\ +\text{syl} \\ +\text{low} \end{bmatrix} \longrightarrow [+\text{lng}] \;/\; \begin{bmatrix} \text{---} \end{bmatrix} \; \text{mV}$$

Theme vowel

sg. pl.

1.	pacāmi	'I cook'	pacāma	'we cook'
2.	pacasi	'you cook'	pacatha	'you cook'
3.	pacati	'{he / she / it} cooks'	pacanti	'they cook'

Notice that the first person sg. and pl. forms have lengthened theme vowels.

9. *Seṭ i insertion* : The vowel *i* is inserted before verb suffixes beginning with *t* in seṭ roots.

$$\phi \rightarrow \begin{bmatrix} -\text{cns} \\ +\text{syl} \\ -\text{grv} \\ +\text{high} \end{bmatrix} \;/\; \underset{\substack{\text{Verb root} \\ (+\text{Seṭ } i \text{ Insert.})}}{\text{]}} \; - \begin{bmatrix} \\ \text{t} \end{bmatrix} \begin{Bmatrix} \text{Past pple.} \\ \text{Gerund.} \\ \text{Infinitive} \\ \text{Gerundive} \end{Bmatrix}$$

Examples:

1.	cal	(root)	'walk'	:	calita (pple.)
					calitvā (gerund)
					calituṃ (infin.)
2.	hn	(root)	'kill	:	hanitabba (gerundive)

10. *s-Simplification*: Geminate *ss's* are reduced to one *s* when the second *s* of the geminate is a part of personal endings.

$$X \quad s \qquad \begin{bmatrix} s \\ \text{Personal ending} \end{bmatrix}$$

$$1 \quad 2 \qquad 3 \Longrightarrow 1 \quad 2$$

Example :

1. as (root) 'be' asi (2nd. sg. pres.)

Derivation :

	as+si
s-Simplification	as+i
	asi

11. *n-Insertion* : When a suffix starts with a vowel and when the masculine stem ends in a non-nasal resonant, *n* is inserted between the stem and a suffix. It is optional when the stem ends in *r*.

$$\phi \longrightarrow \begin{bmatrix} +\text{cns} \\ +\text{nas} \\ -\text{grv} \end{bmatrix} \Big/ \underset{[+\text{mas}]}{\underset{\text{stem}}{\begin{bmatrix} +\text{res} \\ -\text{nas} \end{bmatrix}}} \text{—} \underset{\text{suffix}}{\begin{bmatrix} \text{V} \end{bmatrix}}$$

Examples :

1. ali+ā alinā (inst. masc. sg.) 'bee'
2. bhikkhu+ā bhikkhunā (inst. masc. sg.) 'monk'
3. pitr+o pituno (gen. sg. masc.) 'father'
4. aggi+o aggino (gen. dat. sg. masc.) 'fire'

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Phonological Rules

1. *Reversion of Palatals* :

A. *Reversion of Palatals to Velars* : Palatals change to the corresponding velars before obstruents. The palatal fricative becomes a stop.

$$\begin{bmatrix} +\text{obs} \\ +\text{high} \end{bmatrix} \rightarrow \begin{bmatrix} +\text{grv} \\ -\text{str} \\ -\text{cnt} \end{bmatrix} \; / \; \text{——} \; [\ +\text{obs}\ ]$$

Examples :

1. uc (root) 'speak' vakkhati (3rd. sg. fut.)
2. bhuj (root) 'eat' bhokkhati (3rd. sg. fut.)
3. viś (root) 'dwell' vekkhati (3rd. sg. fut.)
4. drś (root) 'see' dakkhati (3rd. sg. fut.)

Some derivations :

	(1) uc+sy+a+ti
Sampr. Guṇa	uac+sy+a+ti
Rever. of Pal. —A	uak+sy+a+ti
	(2) bhuj+sy+a+ti
Regular Guṇa	bhauj+sy+a+ti
Rever. of Pal. —A	bhaug+sy+a+ti
	(3) viś+sy+a+ti
Regular Guṇa	vaiś+sy+a+ti
Rever. of Pal. —A	vaik+sy+a+ti

These derivations will be completed as the appropriate rules are discusssed. The title of this rule is a historical one. Pāli palatals were originally velars, and velars were never palatalized before obstruents. Synchronically, underlying palatals "revert" to their original forms before obstruents.

This rule must follow the readjustment rule, Seṭ i insertion. See the following derivation:

	sajj+ta 'issued'
Seṭ i insert.	sajj+ita
Rever. of Pal.—A	——

	sajjita
But:	sajj+ta
Rever. of Pal.—A	sagg+ta
Seṭ i insert.	sagg+ita
	**saggita*

B. *Reversion of Palatals to Retroflexes*: Some Palatals become retroflexes instead of velars before obstruents. Roots which undergo this rule instead of the preceding one are marked in the lexicon.

$$\begin{bmatrix} +\text{obs} \\ -\text{grv} \\ +\text{high} \end{bmatrix} \longrightarrow \begin{bmatrix} +\text{flt} \\ -\text{high} \\ -\text{str} \\ -\text{cnt} \end{bmatrix} \Big/ \underline{\quad\quad} \; [+\text{obs}]$$

Examples:

1. yajati 'sacrifices' yiṭṭha (pple.)
2. pucchati 'asks' puṭṭha (pple.)
3. sajati 'lets loose' saṭṭha (pple.)
4. nasati 'destroys' naṭṭha (pple.)

	(1) puch+a+ti	puch+ta
Rev. of Pal.—B	——	puṭ+ta
	(2) ij+a+ti	ij+ta
Sampr. Guṇa	iaj+a+ti	——
Glide Insert.	——	yij+ta
Rev. of Pal.—B	——	yiḍ+ta
	(3) naś+a+ti	naś+ta
Rev. of Pal.—B	——	naṭ+ta

2. *Drop of s With Compensatory Lengthening*: The fricative *s* is dropped before a voiced obstruent with compensatory lengthening of the preceding vowel.

$$V \quad \begin{bmatrix} +\text{obs} \\ +\text{cnt} \\ +\text{str} \end{bmatrix} \quad \begin{bmatrix} +\text{obs} \\ -\text{cnt} \\ +\text{vcd} \end{bmatrix}$$

$$1 \qquad 2 \qquad 3 \Longrightarrow \quad 1 \quad [+\text{lng}] \quad 3$$

Example:

1. Sīdati (3rd sg. pres.) sad (root) 'sink'

Derivation:

	sad+a+ti
Redupl.	si+sd+a+ti
Drop of s	sī+d+a+ti
	sīdati

From the above derivation, it is clear that this rule follows the reduplication rule since the vowel of reduplication is the one that is lengthened.

3. *Retroflexion*:

A. *s-Retroflexion*: The fricative *s* is cerebralized when immediately preceded by the vowels *i*, *u*, and the liquid *r*.

$$\begin{bmatrix} +\text{obs} \\ +\text{cnt} \\ +\text{str} \end{bmatrix} \longrightarrow [+\text{flt}] \; / \; \begin{bmatrix} +\text{res} \\ -\text{nas} \\ +\text{cnt} \end{bmatrix} \text{——}$$

Examples:

1. is (root) 'wish' iṭṭha (pple.)
2. pis (root) 'grind' piṭṭha (pple.)
3. phus (root) 'touch' phuṭṭha (pple.)
4. drś (root) 'see' daṭṭha (pple.)
5. krs (root) 'plough' kaṭṭha (pple.)

Some derivations:

	(1)	(2)
	is+ta	krs+ta
s-Retroflexion	iṣ+ta	krṣ+ta

B. *n-Retroflexion*: *n* becomes retroflex when preceded by *r* or *u*.

$$\begin{bmatrix} +\text{cns} \\ +\text{nas} \end{bmatrix} \longrightarrow [+\text{flt}] \; / \; \begin{bmatrix} +\text{res} \\ -\text{nas} \\ +\text{cnt} \\ +\text{flt} \end{bmatrix} \; \begin{Bmatrix} [-\text{cns}] \\ [+\text{grv}] \end{Bmatrix} \text{——}_{0}$$

Retroflexion after *u* is seldom, and there seems to be no examples except those where the *u* immediately precedes *n*.

n-Retroflexion after u

Examples:

1. āp (root) 'obtain' āpuṇāti (3rd. sg. pres.)
2. sak (root) 'be able' sakkuṇāti (3rd. sg. pres.)
3. sāno (nom. pl. masc.) 'dogs' suṇā (abl. sg. masc.)
4. pra+āp (root) 'obtain' pāpuṇāti (3rd. sg. pres.)
5. sru (root) 'hear' suṇoti (3rd. sg. pres.)

Retroflexion after *r* is quite common, and *r* doesn't have to immediately precede *n*. That is to say, some consonants such as *p* and *k* and any number of vowels may come in between them; but when a dental, retroflex, or palatal intervenes, n-Retroflexion does not take place. This process seems to be an articulatory phenomenon which can best be expressed by an articulatory feature. That is to say, [-cor] consonants allow the process of retroflexion to occur across them since the front of the tongue does not take part in producing them. The feature "coronal" is defined in terms of the activity of the front part of the tongue, while the feature "grave" is not.

n-Retroflexion after r

Examples:

1. tir (root) 'cross' tiṇṇa (pple.)
2. cir (root) 'practice' ciṇṇa (pple.)
3. kir (root) 'scatter' kiṇṇa (pple.)
4. kri (root) 'buy' kiṇāti (3rd. sg. pres.)
5. grjh (root) 'grab' gaṇhāti (3rd. sg. pres.)
6. nara-nārī (nom. pl.) nara-nārīṇaṃ (gen. pl.)
   (Note that *n* of *nāri* is dental.)

Some derivations:

	(1)	(2)
	sun+ā	sru+no+ti
n-Retrofl.	suṇ+ā	sru+ṇo+ti
	suṇā	

	(3)	(4)
	tir+na	kir+na
n-Retrofl.	tir+ṇa	kir+ṇa

	(5)		(6)	
	kri+nā+ti		nara-nārī+nam	
n-Retrofl.	kri+ṇā+ti		nara-nārī+ṇam	

Several nouns are exceptions to this rule, but there seem to be no exceptions among verbs. The second *n* of *nara-nāriṇaṃ* is not an exception since this word is a compound, containing a word boundary, and this rule does not apply across word boundaries.

4. *s-Dissimilation*: *s* becomes a stop before another *s*.

$$\begin{bmatrix} +\text{obs} \\ -\text{grv} \\ -\text{high} \end{bmatrix} \longrightarrow \begin{bmatrix} -\text{cnt} \\ -\text{str} \end{bmatrix} \Big/ \text{——} \begin{bmatrix} +\text{obs} \\ +\text{cnt} \\ +\text{str} \end{bmatrix}$$

Examples:

1. us (root) 'dwell' vacchati (3rd. sg. fut.)
2. ghas (root) 'eat' jighacchati (3rd. sg. des.)

Derivations:

	(1)		(2)	
	us+sy+a+ti		ghas+s+a+ti	
Sampr. Guṇa	uas+sy+a+ti		——	
Redupl.	——		ji+ghas+s+a+ti	
s-Dissim.	uat+sy+a+ti		ji+ghat+s+a+ti	

5. *Syllabification of Resonants*: Resonants become syllabic between two consonants.

$$[-\text{obs}] \longrightarrow [+\text{syl}] \Big/ \text{C} \text{——} \begin{Bmatrix} \text{C} \\ \# \end{Bmatrix}$$

Examples:

1. pitaraṃ (acc. sg.) 'father' pituno (gen. sg.)
2. rājānaṃ (acc. sg.) 'king' rājūhi (inst. pl.)
3. karoti (3rd. sg. pres.) 'does' kata (pple.)
4. gamissati (3rd. sg. fut.) 'will go' gata (pple.)
5. bharantaṃ (acc. sg.) 'bearing' bharato (gen. sg.)

Derivations:

	(1)	
	pitr+am	pitr+o
Regular Guṇa	pitar+am	——

n-Insert.	——	pitr+no
Syl. of Res.	——	pitṛ+no
	(2) rājn+am	rājn+hi
Vṛddhi	rājān+am	——
Syl. of Res.	——	rājn̥+hi
	(3) kr+o+ti	kr+ta
Regular Guṇa	kar+o+ti	——
Syl. of Res.	——	kṛ+ta
	(4) gm+isy+a+ti	gm+ta
Regular Guṇa	gam+isy+a+ti	——
Syl. of Res.	——	gṃ+ta
	(5) bhr+nt+am	bhr+nt+o
Regular Guṇa	bhar+ant+am	bhar+nt+o
Syl. of Res.	——	bhar+ṇt+o

This rule must follow *n*-Insertion othewise:

	pitr+o
Syl. of Res.	—— (inapplicable)
n-Insert.	pitrn+o
r-Assim.	pittn+o
Gem. Red.	pitn+o
Cons. Assim.	pinno
	**pinno*

Syllabic liquids and nasals become *u* if they are at the end of a noun stem. Other syllabic nasals and liquids usually become *a*, but sometimes they become *u* or *i*. Roots whose syllabic nasals and liquids become *u* or *i* irregularly are maked +u or +*i* in the lexicon.

6. *Fate of Syllabic Resonants*:A syllabic consonant becomes *u* in noun stems; it becomes *i* or *u* in words which are marked +*i* or +*u* respectively. In the rest of the cases, it becomes *a*.

$$\begin{bmatrix}+\text{cns}\\+\text{syl}\end{bmatrix} \longrightarrow \left\{ \begin{array}{ll} \begin{bmatrix}-\text{cns}\\+\text{high}\\+\text{grv}\end{bmatrix} & / \quad \left\{ \begin{array}{l} \text{——} \\ [+\text{u}] \end{array} \right\}_{\text{Noun stem}} \\ \begin{bmatrix}-\text{cns}\\+\text{high}\\-\text{grv}\end{bmatrix} & / \quad [+\text{i}] \\ \begin{bmatrix}-\text{cns}\\+\text{low}\\-\text{lng}\end{bmatrix} & \end{array} \right\} \quad \text{(Very minor)}$$

Examples :

1. Pitaraṃ (acc. sg.) pituno (gen. sg.)
2. rājānaṃ (acc. sg.) rājūhi (inst. pl.)
3. karoti (3rd. sg. pres.) kata (pple.)
4. gamissati (3rd. sg. fut.) gata (pple.)
5. bharantaṃ (acc. sg.) bharato (gen. sg.)

	(1)	pitr+am	pitr+o
Regular Guṇa		pitar+am	———
n-Insert.		———	pitr+no
Syl. of Res.		———	pitṛ+no
Fate of Syl. Res.		———	pituno
			piluno
	(2)	rājn+am	rajn+hi
Regular Vṛddhi		rājān+am	———
Syl. of Res.		———	rājn̥+hi
Fate of Syl. Res.		———	rāju+hi
	(3)	kr+o+ti	kr+ta
Regular Guṇa		kar+o+ti	———
Syl. of Res.		———	kṛ+ta
Fate of Syl. Res.		———	ka+ta
		karoti	*kata*
	(4)	gm+isy+a+ti	gm+ta
Regular Guṇa		gam+isy+a+ti	———
s-Retrofl.		gam+iṣy+a+ti	———

Syl. of Res,	———	gṃ+ta
Fate of Syl. Res.	————	ga+ta: *gata*
	(5) bhr+nt+am	bhr+nt+o
Regular Guṇa	bhar+ant+am	bhar+nt+o
Syl. of Res.	———	bhar+nt+o
Fate of Syl. Res.	———	bhar+at+o
		Bharato

Some more examples of Fate of Syllabic Resonants :

		Root	3rd. sg. pres.	pple.
1.	vr [+u]	'wish'	varati	vuta
2.	mr	'die'	marati	mata
3.	sr [+i]	'flow'	sarati	sita

u is especially common in the vicinity of labials, and *i* in the vicinity of sibilants.

This rule must follow s-Retroflexion; otherwise, *r* will change to *a*, and *s* is not retroflected after *a*. It must follow Syllabification of Resonants because syllabic resonants are the input to this rule.

7. *Vowel Lengthening in Plurals* : The last vowel of a noun stem in the plural is long if the suffix begins with a consonant or if the suffix is zero (ϕ) :

$$V \longrightarrow [+lng] \;/\; \text{——} \;] \; \begin{Bmatrix} C \\ \# \end{Bmatrix}$$

Noun stem
+pl.

Examples :

1.	aggi 'fire'	aggīnaṃ (gen. pl.) aggīsu (loc. pl.) aggīhi (inst. pl.)
2.	bhikkhu 'monk'	bhikkhūnaṃ (gen. pl.) bhikkhūsu (loc. pl.) bhikkhūhi (inst. pl.)

3. mātr 'mother'	mātūnaṃ (gen. pl.) mātūsu (loc. pl.) mātūhi (inst. pl.)
4. rājn 'king'	rājūnaṃ (gen. pl.) rājūsu (loc. pl.) rājūhi (inst. pl.)

Some derivations:

	rājn+am	rājn+hi
n-Insertion	rājn+nam	———
Syl. of Res.	rājṇ+nam	rājn̥+hi
Fate of Syl. Res.	rāju+nam	rāju̯+hi
Vowel Length. in Pl.	rājū+nam	rājū+hi
		rājūhi

This rule must follow n-Insertion as shown in the derivation because, before n-Insertion, the genitive pl. suffix begins with a vowel rather than a consonant. It also must follow the syllabification of resonants since this rule creates new vowels which become lengthened.

8. *Unnatural Sandhi Generalization* : *as* becomes *o* at the end of the word.

$$\begin{bmatrix} -\text{cns} \\ +\text{syl} \\ +\text{low} \end{bmatrix} \quad \begin{bmatrix} +\text{obs} \\ +\text{cnt} \\ +\text{str} \end{bmatrix} \quad \# \qquad 1 \quad 2 \qquad 3 \Rightarrow \begin{bmatrix} 1 \\ -\text{low} \\ +\text{flt} \\ +\text{long} \end{bmatrix}$$

Example :

mano 'mind' (nom. sg.) manasā (inst. sg.)

Derivation :

	manas+o	manas+ā
Unnat. Sandhi Gener.	mano	———
	mano	*manasā*

9. *Long High Vowel Separation*: The long high vowels *i* and *ū* are separated into their component parts *iy* and *uw*, respectively, if preceded by an initial consonant and followed by a suffix which begins with a vowel.

$$\begin{bmatrix} C & \begin{bmatrix} -\text{cns} \\ +\text{syl} \\ +\text{high} \\ +\text{long} \end{bmatrix} + & V \end{bmatrix}$$

Root

1 2 3 4 ⟹ 1 2 2 3 4

[—lng] [—syl, —lng]

Examples :

1. bhū 'earth'/ (nom. sg.) bhuvi (loc. sg.)
2. bhū/hū 'be' hūta (pple.)
   ahuvattha (2nd. pl. aor.)
3. thi/itthi 'a woman' thiyo/itthiyo (nom. pl.)

Derivation :

	bhū+i
Long High Vow. Sep.	bhuw+i
Fric. of w△	bhuv+i
	bhuvi

The appropriateness of this rule will be discussed under Glide Formation.

This rule must follow Guṇa. Note the following derivations:

(1)	bhū+a+ti
Regular Guṇa	bhaū+a+ti
Glide Form.△	bhaw+a+ti
Fric. of w△	bhav+a+ti
	bhavati
(2)	bhū+a+ti
Long High Vow. Sep.	bhuw+a+ti
Regular Guṇa	bhauw+a+ti

△indicates that the rule is to be discussed later.

Mid Vow. Form.$^{\triangle}$ bhow+a+ti

Fric. of w$^{\triangle}$ bhov+a+ti

**bhovati*

10. *Like Vowel Coalescence*: Like simple vowels coalesce to the corresponding long vowel.

$$\begin{Bmatrix} C \\ \# \end{Bmatrix} \quad V \quad \begin{Bmatrix} C \\ \# \end{Bmatrix}$$
$$1 \qquad 2 \qquad 3$$
$$1 \qquad 2 \qquad 2 \qquad 3 \Longrightarrow 1 \qquad 2 \qquad 3$$
$$[\pm \text{lng}] \quad [\pm \text{lng}] \qquad [+\text{lng}]$$

Examples :

1. ita 'gone' (pple.) atīta 'past, gone by'
2. as 'be' (root) āsi 'was'

Derivations:

Like Vow. Coales. (1) ati+ita
atī+ta
atīta

Like Vow. Coales. (2) a+as+i (aor.)
ās+i
āsi

This rule and the preceding rule are not ordered with respect to each other because they apply to mutually exclusive environments.

11. *Glide Formation* : The high vowels *i* and *u* become respectively the glides *y* and *w* before vowels. *u* also becomes a glide if it is initial or preceded by a vowel and followed by *y*+vowel.

(a) $\begin{bmatrix} -\text{cns} \\ +\text{high} \\ +\text{grv} \end{bmatrix} \longrightarrow [-\text{syl}] / \begin{Bmatrix} V \\ \# \end{Bmatrix} __ \begin{bmatrix} -\text{cns} \\ -\text{syl} \\ -\text{grv} \end{bmatrix} V$

(b) $\begin{bmatrix} -\text{cns} \\ +\text{high} \end{bmatrix} \longrightarrow [-\text{syl}] / __ V$

These two rules may be collapsed as follows :

$$\begin{bmatrix} -\text{cns} \\ +\text{high} \\ \langle +\text{grv} \rangle \end{bmatrix} \longrightarrow [-\text{syl}] \; / \; \left\langle \begin{Bmatrix} \text{V} \\ \# \end{Bmatrix} \right\rangle \left\langle \begin{bmatrix} -\text{cns} \\ -\text{syl} \\ -\text{grv} \end{bmatrix} \right\rangle \text{V}$$

This rule may apply several times within the same word. It must apply from right to left without any regard for longest or shortest possible environments.

For example: (hypothetical forms) :

(1) diut——dyut

(only *i* meets the structural description.)

(3) diua——diwa, not *dywa

(both *u* and *i* meet the structural description; *u* is farthest to the right.)

(3) duiua——dwiwa

(*u* is farthest to the right and becomes a glide. *i* is no longer before a vowel and remains. *u* is before a vowel and becomes a glide.)

(4) duia——duya

(*i* is farthest to the right and becomes a glide. Then *u* does not meet the S. D.)

(5) uia——wya

(*i* is farthest to the right and becomes a glide. Then *u* is in the environment #——yV and becomes a glide.)

(6) diuia——diwya, not *dyuya

(*i* is farthest to the right and becomes a glide. Then *u* is in the environment V——yV and becomes a glide.)

(7) uiua=—wiwa

(*u* is farthest to the right and becomes a glide. *i* is then not before a vowel. Initial *u* is before the vowel *i* and becomes a glide.)

(8) iuia—iwya, not *yuya

(*i* is farthest to the right and becomes a glide. *u* is then in the environment V——yV and becomes a glide. Initial *i* is then not before a vowel and remains.)

(9) aiua——ewa, not *aywa

(*u* is farthest to the right and becomes a glide. Then *i* is not before a vowel and remains. A later rule coalesces a+i to *e* and a+u to *o* before a consonant.)

As usual, the braces in this rule obscure a generalization. *u* may become w before y+vowel if it is at the beginning of a syllable. The configuration $\left\{ \begin{matrix} V \\ \# \end{matrix} \right\}$ should perhaps be replaced by a syllable-boundary symbol. McCawley (1971) has questioned the validity of braces.

The form of this rule anticipates a later rule which converts the glide *w* to an obstruent, *v*. Syllable-initial *u* can become *w* before *y*+ vowel, but syllable-initial *i* cannot become *y* before *w*+ vowel because it is far more natural for a syllable to begin with obstruent + glide + vowel than with glide + obstruent + vowel.

Examples:

	3rd. sg. pres.		past participle
1.	dibbati	'amuses oneself'	jūta
2.	cavati	'moves' (cāveti caus.)	cuta
3.	nayati	'leads'	nīta
4.	bhavati	'is'	bhūta
5.	vacati	'speaks'	vutta

Also: sā (nom. sg.) sāno (nom. pl.)
suṇā (abl. sg.)

Derivations:

	Glide Form	
(1)	diū+y+a+ti	diū+ta
	diw+y+a+ti	dyū+ta
	Regular Guṇa Glide Form.	
(2)	cu+a+ti	cu+ta
	cau+a+ti	.....
	caw+a+ti	.....
		cuta
	Regular Guṇa Glide Form.	
(3)	nī+a+ti	nī+ta
	naī+a+ti	.....
	nay+a+ti	....
	nayati	*nita*

	(4) bhū+a+ti	bhū+ta
Regular Guṇa	bhaū+a+ti	.....
Glide Form.	bhaw+a+ti	....
		bhūta
	(5) uc+a+ti	uc+ta
Sampr. Guṇa	uac+a+ti	....
Glide Insert.	——	wuc+ta
Rever. of Pal. -A	——	wuk+ta
Glide Form.	wac+a+ti	——

(6)	nom. sg.	nom. pl.	abl. sg.
	sun+ϕ	sun+o	sun+ā
Vrddhi	suān+ϕ	suān+o	——
Drop of Nas.	suā	———	——
n-Retrofl.	———	———	suṇ+ā
Glide Form.	swā	swān+o	———
			suṇā

This rule must follow Guṇa and Vṛddhi, otherwise it would not apply to *vacati*. It must also follow n-Insertion. Compare the following derivations.:

	prāni+ā	'hand' (inst. sg.)
n-Insert.	prāni+nā	
n-Retrofl.	prāṇi+nā	
Glide Form.	———	
r-Assim.△	ppāṇi+nā	
Gem. Red.	pāṇi+nā	
	pāṇinā	
	prāni+ā	
n-Retrofl.	prāṇi+ā	
Glide Form.	prāṇy+ā	
n-Insert.	prāṇy+nā	
r-Assim.△	ppāṇy+nā	
Gem. Red.	pāṇy+nā	
	**pāṇynā*	

Like Vowel Coalescence must both precede and follow Glide Formation. See the following derivations:

	paṭi+i+ta	paṭi+i+a+ti
Sampr. Guṇa	———	paṭi+ia+a+ti
Like Vowel Coales.	paṭī+ta	———
Glide Form.	———	paṭi+ya+a+ti
Like Vowel Coales.	———	paṭi+yā+ti
	paṭita	*paṭiyāti*

If we order Like Vowel Coalescence before Glide Formation, we arrive at the following forms.

	paṭi+i+ta	paṭi+i+a+ti
Sampra. Guṇa	———	paṭi+ia+a+ti
Like Vowel Coales.	paṭī+ta	———
Glide Form.	———	paṭi+ya+a+ti
	paṭita	**paṭiyaati*

If we order Glide Formation before Like Vowel Coalescence, we get the following derivation.

	paṭi+i+ta	paṭi+i+a+ti
Sampr. Guṇa.	———	paṭi+ia+a+ti
Glide Form.	paṭy+i+ta	paṭi+ya+a+ti
Like Vowel Coales.	———	paṭi+yā+ti
	**paṭyita*	*paṭiyāti*

This rule must follow Long High Vowel Separation. *i* and *ū* must be allowed to change into *y* and *w*, not into *iy* and *uw*, unless they meet the environment for Long High Vowel Separation. See the following derivations:

		(1) bhū+i (loc. sg.)
Long High Vow. Sep.		bhuw+i
Glide Form.		———
Fric. of w$^{\Delta}$		bhuv+i
		bhuvi
		bhū+i
Glide Form.		bhw+i
Long High Vow. Sep.		———
Fric. of w$^{\Delta}$		bhv+i
		**bhvi*

	(2)	bhū+a+ti
Regular Guṇa		bhaū+a+ti
Long High Vow. Sep.		———
Glide Form.		bhaw+a+ti
Fric. of w$^{\Delta}$		bhav+a+ti
		bhavati

If we do not restrict the environment of Long High Vowel Separation as given, we get the following:

	bhū+a+ti
Regular Guṇa	bhaū+a+ti
Long High Vow. Sep.	bhauw+a+ti
Mid Vow. Form.	bhow+a+ti
Fric. of w$^{\Delta}$	bhov+a+ti
	**bhovati*

If we try to do without Long High Vowel Separation and, instead, posit *ii* instead of *i* and *uu* instead of *ū*, we get the derivation of the following sort.

(a) Like Vowel Coalescence before Glide Formation:

	bhuu+i	bhuu+a+ti
Regular Guṇa	———	bhauu+a+ti
Like Vow. Coales.	bhū+i	bhaū+a+ti
Glide Form.	bhw+i	bhaw+a+ti
Fric. of w$^{\Delta}$	bhv+i	bhav+a+ti
	**bhvi*	*bhavati*

(b) Glide Formation before like vowel coalescence:

	bhuu+i	bhuu+a+ti
Regular Guṇa	———	bhauu+a+ti
Glide Form.	bhuw+i	bhauw+a+ti
Like Vow. Coales.	———	———
Mid Vow. Form.$^{\Delta}$	———	bhow+a+ti
Fric. of w$^{\Delta}$	bhuv+i	bhov+a+ti
	bhuvi	**bhovati*

Inspection should show that allowing Like Vowel Coalescence to apply before and after Glide Formation will not help

matters in this situation. We clearly need a Long High Vowel Separation rule.

It should be noted that I am not claiming that Like Vowel Coalescence apply either before or after Glide Formation. Rather, I am claiming that if it is applicable before Glide Formatian, it must apply and if it is applicable after Glide Formation, it must apply.

12. *y-Gemination*: The glide *y* becomes a geminate between two vowels if the preceding vowel is high. This rule applies mainly in the passive and in the gerundive. It is historically responsible for geminate *y* in the optative suffixes.

	$\begin{bmatrix}-\text{cns}\\+\text{syl}\\+\text{high}\end{bmatrix}$		$\begin{bmatrix}-\text{cns}\\-\text{syl}\\-\text{grv}\end{bmatrix}$	V
SD :	1		2	3
SC :	1	2	2	3

Examples :

1. abhi+bhu 'overcome' abhibhuyya (ger.)
2. di 'give' deyya (ger.)

Derivations :

	(1) abhi+bhū+ya
y-Gem.	abhi+bhū+yya
Vowel Short. △	abhi+bhu+yya
	abhibhuyya
	(2) di+ya
Regular Guṇa	dai+ya
y-Gem.	dai+yya
Mid. Vow. Form.	de+yya
	deyya

This rule must follow Glide Formation, otherwise, we get the wrong form.

	bhū+ya
Regular Guṇa	bhaū+ya

	bhaū+yya
y-Gem.	——
	**bhaūyya*

It must precede Mid Vowel Formation, otherwise, *ai* will change into *e* after which y-Gemination will not be applicable.

It must precede i-Insertion between *r* and *y* ; otherwise, *y* will become a geminate since the inserted *i* will fulfill the requirement for y-Gemination. For example, see the derivation of *mariya* (ger.) :

	mr+ya
Regular Guṇa	mar+ya
i-Insert.	mar+iya
y-Gem.	mar+iyya
	**mariyya*

13. *Coalescence of Glides with Vowels* : When the glides *y* and *w* appear between three occurrences of three segments, together they merge to mid vowel agreeing in gravity and flatness with the glide. In other words, *aya* becomes *e* and *awa* becomes *o*.

$$\begin{bmatrix} -\text{cns} \\ +\text{syl} \\ +\text{low} \\ -\text{lng} \end{bmatrix} \quad \begin{bmatrix} -\text{cns} \\ -\text{syl} \end{bmatrix} \quad \begin{bmatrix} -\text{cns} \\ +\text{syl} \\ +\text{low} \end{bmatrix}$$

$$1 \qquad 2 \qquad 3 \qquad \Longrightarrow \qquad \overset{2}{\begin{bmatrix} +\text{syl} \\ -\text{high} \\ +\text{lng} \\ -\text{low} \end{bmatrix}}$$

Examples :

1. nayati/neti 'leads'
2. bhavati/hoti 'is, becomes'

Notice that this is an optional rule and accounts for the extra forms which occasionally occur.

This rule must follow Guṇa and Vṛddhi as well as the Glide Formation rule. The Glide Formation rule provides the input for the operation of this one. See the following derivations :

	ni+a+ti	jhu+a+ti
Regular Guṇa	nai+a+ti	jhau+a+ti
Glide Form	nay+a+ti	jhaw+a+ti
Coales. of Gl. with Vowels	ne+ti	jho+ti
Weak. of Vcd. Asp.△	——	ho+ti
	neti	*hoti*

14. *Weakening of Voiced Aspirates* : The voiced aspirate *jh* becomes *h* everywhere.

$$\begin{bmatrix} +\text{obs} \\ -\text{grv} \\ -\text{cnt} \\ +\text{high} \\ +\text{vcd} \\ +\text{H.S.P.} \end{bmatrix} \Longrightarrow \begin{bmatrix} -\text{cns} \\ -\text{obs} \\ -\text{str} \\ -\text{high} \\ +\text{grv} \\ +\text{cnt} \end{bmatrix}$$

Examples :

1. vahati 'carries' vivakkhati (3rd. sg. des.)
2. juhoti 'sacrifices' huta (pple,)
3. duhati 'milks' duddha (pple.)
4. lehati 'writes' liḷha (pple.)

Derivations :

	(1) ujh+a+ti	
Sampr. Guṇa		uajh+a+ti
Glide Form.		wajh+a+ti
Weak. of Vcd. Asp.		wah+a+ti
	(2) jhu+ti	
Regular Guṇa		jhau+ti
Redupl.		ju+jhau+ti
Weak. of Vcd. Asp.		ju+hau+ti
	(3) dujh—ta	dujh+a+ti
Regular Guṇa	——	daujh+a+ti
Rever. of Pal.—A	dugh+ta	——
Weak. of Vcd. Asp.	——	dauh+a+ti
	(4) lijh+ta	lijh+a+ti
Regular Guṇa	——	laijh+a+ti

Rever. of Pal.—A	ligh+ta	——
Weak. of Vcd. Asp.	——	laih+a+ti

Examples of other voiced aspirates :

1. bhū 'be' 'bhūta/hūta (pple.)
2. Skt. labhadhve Pāli labhavhe (by metathesis)

This rule must follow Reduplication and Reversion of Palatals. If it didn't follow Reduplication, *h* will be reduplicated as *h* instead of *j*, if it didn't follow Reversion of Palatals, *h* will not revert because it is not a palatal.

The rule Weakening of Voiced Aspirates seems to be unnatural on the face since both of these segments have nothing in common and to state the rule, eleven features are needed. However, *h* behaves like a palatal affricate in the Reduplication rule as well as in the rule which reverses Palatals to their corresponding velars. It behaves like aspirated voiced stop (dh) in Bartholomea's Law. It is best to treat *h* as *jh* to avoid specifying its features three times, in Reduplication, the Reversion of Palatals, and Bartholomea's Law.

Secondly, *jh's* are very rare in Pāli. Most of the *jh's* found in Pāli come from *dh's* which are palatalized by the glide *y*. The four or five words having other *jh's* will have to be marked as exceptions to this rule.

Thirdly, positing *h* as *jh* can be historically justified. Some Vedic dialects changed *dh* to *h* before *i*. One could expect the Palatalization of *dh* before *i*. This dialect generalized the rule : Voiced Palatal Aspirate $>h$ to Voiced Palatal or Palatalized Aspirate $>h$. Finally, the rule tends to be further generalized in Middle Indic, all voiced aspirates being likely to change to *h*; e.g. *bhavati* : $>$*hoti*. Obviously, there is a natural relation between aspirates and *h*. No feature systems existing at present put aspirated stops and h in one class, thus making the class natural. There is a good reason for that. In a sense, they do not form a natural class. For example, all aspirated stops are stronger than unaspirated stops. Unaspirated stops have more of a tendency to drop, especially intervocalically. On the otherhand, *h* is the weakest of all consonants and is usually first to drop.

15. *Progressive Palatalization of Nasals* : The nasal *n* becomes palatalized after palatal consonants.

$$\begin{bmatrix} +\text{cns} \\ +\text{nas} \\ -\text{grv} \end{bmatrix} \longrightarrow [+\text{high}] \;/\; \begin{bmatrix} +\text{obs} \\ +\text{high} \\ -\text{grv} \end{bmatrix} \text{——}$$

Examples :

1. Rājānaṃ 'king' (acc. sg.) raññā (abl. sg.)
2. janati 'gives birth' ñāti-'relative' (derived noun)

Derivations :

	(1) rājn+am	rājn+ā
Vṛddhi	rājān+am	——
Prog. Pal. of Nas.	——	rājñ+ā
	(2) jn+a+ti	jn+āti
Regular Guṇa	jan+a+ti	——
Prog. Pal. of Nas.	——	jñ+āti

janati

The above derivations show that this rule must follow Guṇa and Vṛddhi.

This rule must also follow Weakening of Voiced Aspirates; otherwise, we will get **gañhāti* instead of *gaṇhāti* from *grajhnāti*.

16. *The Drop of Intervocalic w, (Minor rule)* : *w* is occasionally lost between the low vowel *a* and the high vowel *i* in some forms of *bhū*.

$$\begin{bmatrix} -\text{cns} \\ -\text{syl} \\ +\text{grv} \\ +\text{high} \end{bmatrix} \longrightarrow \phi \;/\; \begin{bmatrix} -\text{cns} \\ +\text{syl} \\ +\text{low} \end{bmatrix} \text{——} \begin{bmatrix} -\text{cns} \\ +\text{syl} \\ +\text{high} \\ -\text{grv} \end{bmatrix}$$

Examples :

1. hoti 'becomes' ahesuṃ (3rd. pl. aor.)
   hessati (3rd. sg. fut.)

Some derivations :

hū+a+ti a+hū+is+uṃ hū+isy+a+ti

Regular Guṇa	haū+a+ti	a+haū+is+uṃ	haū+isy+a+ti
Glide Form	haw+a+ti	a+haw+is+uṃ	haw+isy+a+ti
Coales. of Gl. with Vowels	ho+ti	——	——
Drop of Inter. w	——	a+ha+is+uṃ	ha+isy+a+ti
	hoti		

This rule must follow Guṇa and Glide Formation. Glide Formation creates the *w* and Guṇa makes it intervocalic.

17. *Mid Vowel Formation*: The low vowels *a* and *ā* merge with *i* to form *e* and with *u* to form *o*.

$$\begin{bmatrix} -\text{cns} \\ +\text{syl} \\ +\text{low} \end{bmatrix}_1 \quad \begin{bmatrix} -\text{cns} \\ +\text{high} \\ -\text{low} \end{bmatrix}_2 \quad \begin{Bmatrix} \text{C} \\ \# \end{Bmatrix}_3 \Longrightarrow \quad 2 \quad 3$$

$$\begin{bmatrix} -\text{high} \\ +\text{lng} \end{bmatrix}$$

Examples:

1. lijh 'write' lehati (3rd. sg. pres.)
2. mujh 'move' momuhati (3rd. sg. intns.)

Some derivations:

	(1)	lijh+a+ti
Regular Guṇa		laijh+a+ti
Weak. of Vcd. Asp.		laih+a+ti
Mid Vow. Form.		leh+a+ti
		lehati
	(2)	mujh+a+ti
Redupl.		māu+mujh+a+ti
Weak. of Vcd. Asp.		māu+muh+a+ti
Mid Vow. Form.		mo+muh+a+ti
		momuhati
	(3)	a+hū+is+um hū+isy+a+ti
Regular Guṇa		a+haū+is+um haū+isy+a+ti

Glide Form.	a+haw+is+um	haw+isy+a+ti
Drop of Inter. w	a+ha+is+um	ha+isy+a+ti
Mid Vow. Form.	a+he+s+um	he+sy+a+ti

The above derivations indicate that this rule must follow the rule, Drop of Intervocalic w.

This rule must follow s-Retroflexion; otherwise, it will not be possible to get retroflex *ṣ*'s since *i* and *u* will merge with low vowels resulting in *e* and *o* thus taking away the environment necessary for retroflexion of *s*. For example, see the derivations of *phusati* 'touches' (3rd. sg. pres.), and *phoṭṭhabba* (ger.).

Derivations:

	phus+a+ti	phus+tabba
Regular Guṇa	———	phaus+tabba
s-Retrofl.	phuṣ+a+ti	phaus+tabba
Mid Vow. Form.	———	phoṣ+tabba

If Mid Vowel Formation had preceded s-Retroflexion, the *s* in the gerundive would not have become retroflex. This rule must follow Glide Formation since hypothetical *auia* must give *avya* and eventually *abba*, rather than **oya*. The former sequence is possible while the latter is impossible.

18. *Assimilation of Front Consonants Before s*: Front Consonants (-high), which precede *s*, assimilate to it in gravity, stridance, and flatness. In other words, *p* and *t* become t^s before *s*.

$$\begin{bmatrix} +\text{obs} \\ -\text{high} \end{bmatrix} \longrightarrow \begin{bmatrix} -\text{grv} \\ -\text{flt} \\ +\text{str} \end{bmatrix} / \text{———} \begin{bmatrix} +\text{obs} \\ +\text{cnt} \\ +\text{str} \end{bmatrix}$$

Examples:

1. īp 'wish to reach' icchati (3rd. sg. des.)
2. gup 'shun' jigucchati (3rd. sg. des.)
3. ghas 'eat' jighacchati (3rd. sg. des.)
4. kit 'think over' cikicchati (3rd. sg. des.)
5. ut+sād 'to rub the body with oil' ucchadéti (3rd. sg. pres.)

6. chid 'to cut off' checchati (3rd. sg. fut.)
7. bhid 'to split' bhecchati (3rd. sg. fut.)
8. labh 'obtain' lacchati (3rd. sg. fut.)
9. us 'dwell' vacchati (3rd. sg. fut.)

Derivations:

	(1)	(2)
	īp+s+a+ti	gup+s+a+ti
Redupl.	ī+īp+s+a+ti	ji+gup+s+a+ti
Like Vow. Coales.	īp+s+a+ti	———
Assim. of Fr. Cons.	it^s+s+a+ti	ji+gut^s+s+a+ti

	(3)	(4)
	ghas+s+a+ti	kit+s+a+ti
Redup.	ji+ghas+s+a+ti	ci+kit+s+a+ti
s-Dissim.	ji+ghat+s+a+ti	———
Assim. of Fr. Cons.	ji+$ghat^s$+s+a+ti	ci+kit^s+s+a+ti

	(5)	(6)
	chid+sy+a+ti	bhid+sy+a+ti
Regular Guṇa	chaid+sy+a+ti	bhaid+sy+a+ti
Mid. Vow. Form.	ched+sy+a+ti	bhed+sy+a+ti
Assim. of Fr. Cons.	$ched^z$+sy+a+ti	$bhed^z$+sy+a+ti

	(7)	(8)
	labh+sy+a+ti	us+sy+a+ti
Sampr. Guṇa	———	uas+sy+a+ti
s-Dissim.	———	uat+sy+a+ti
Glide Form.	———	wat+sy+a+ti
Assim. of Fr. Cons.	lad^zh+sy+a+ti	wat^s+sy+a+ti^s

19. *Nasal Assimilation to Liquids:* When a nasal precedes a liquid, it is completely assimilated.

$$\begin{bmatrix} +\text{cns} \\ +\text{nas} \end{bmatrix} \qquad \begin{bmatrix} +\text{cns} \\ -\text{obs} \\ -\text{nas} \end{bmatrix}$$

$$1 \qquad 2 \Longrightarrow \qquad 2 \qquad 2$$

Examples:

1. lapati 'talks' (3rd. sg. pres.)
   sallapati 'converses'

2. līna 'slow' (adj.)
   sallīna 'sluggish'

3. rāga 'passion' (noun)
   sārāga 'affection'

Derivations:

(1) sam+lap+a+ti
Nas. Assim. to Liq. sal+lap+a+ti
sallapati

(2) sam+rāga
Nas. Assim. to Liq. sar+rāga

20. *Prefix Vowel Nasalization*: If a nasal is at the end of a prefix and is followed by *y*, *r*, or *w* at the beginning of the root, it is dropped, and the preceding vowel is nasalized.

$$\begin{matrix} V & N \\ & \end{matrix}\Big] \quad \Big[\quad \Big[\begin{matrix} -\text{obs} \\ -\text{nas} \\ -\text{syl} \end{matrix} \Big]$$

prefix Root

1 2 3 $\Longrightarrow$ 1 3

[+nas]

Examples:

1. yamati 'restrains' saṃyamati 'draws together'
2. rakkhati 'protects' saṃrakkhati 'guards'
3. rūhati 'spread' saṃrūhati 'grows'
4. vaḍḍhati 'grows' saṃvaḍḍhati 'grows up'
5. vasati 'lives' saṃvasati 'cohabitates'
6. yuñjati 'connects' saṃyuñjati 'joins with'

Some Derivations:

(1) sam+yam+a+ti (2) sam+rūh+a+ti
Prefix Vow. Nas. saṃ+yam+a+ti saṃ+rūh+a+ti
saṃyamati *saṃrūhati*

	(3) sam+us+a+ti
Regular Guṇa	sam+uas+a+ti
Glide Form.	sam+vas+ti
Prefix Vow. Nas.	saṃ+vas+a+ti
	saṃvasati

This rule must follow Nasal Assimilation to Liquids since, if a prefix ends with a nasal and the following root begins with *l*, the result is always *ll* and never nasalization plus *l*. The nasal consonant must still be present so that assimilation can take place.

21. *Bartholomea's Law*: Stops become voiced aspirates after voiced aspirates.

$$\begin{bmatrix} +\text{obs} \\ -\text{cnt} \end{bmatrix} \longrightarrow \begin{bmatrix} +\text{H.S.P.} \\ +\text{Vcd} \end{bmatrix} \Big/ \begin{bmatrix} +\text{obs} \\ -\text{cnt} \\ +\text{H.S.P.} \\ +\text{vcd} \end{bmatrix} \text{——}$$

Examples:

1. rudhati 'prevents' ruddha (pple.)
2. budhati 'knows' buddha (pple.)
8. labhati 'obtains' laddha (pple.)
4. randhati 'harasses' randha (pple.)

Derivations:

	(1) rudh+ta	(2) budh+ta
Barth. Law	rudh+dha	budh+dha
	(3) ladh+ta	(4) randh+ta
Barth. Law	ladh+dha	randh+dha
Gem. Red.	————	randh+a
		randha

Bartholomea's Law can be explained on the basis of acoustics. The consonants such as *t*, *th*, *p*, *ph*, *ṭ*, *ṭh*, *k* and *kh* are tense as opposed to lax *d*, *dh*, *b*, *bh*, *ḍ*, *ḍh*, *g* and *gh*. But only *dh*, *bh* and *gh* are voiced aspirated consonants. In the production of a tense consonant which is followed by a vowel, the

articulatory muscles are tense. These muscles keep these consonants from voicing at the onset of the vowel. But when lax consonants are followed by a vowel, the onset voicing of vowels affect them. The reason for this is that the muscles are laxed in their production. In the production of a lax unaspirated consonant, followed by a tense (voiceless) consonant, the former becomes tense and obviously voiceless, since the muscles become tense and prevent the latter from voicing. The offset is voiceless since the onset of the next consonant is voiceless. If the consonants are voiced aspirates, then the voicing starts from the very beginning. In the production of successive voiced and voiceless consonants, the voicing of the first one is carried over to the latter. Bartholomea's Law, then, is, in effect, the voicing of a segment between two voiced segments. This phenomenon is extremely common in natural languages; its most common occurrence is intervocalic voicing. A tense consonant becomes laxed as well as voiced between voiced segments.

Thus:

b.h.	t.	a	
voiced	voiceless	voiced	
lax	tense	syllabic	⟶
b.h.	d.	a.	
voiced	voiced	voiced	
lax	lax	syllabic	

This rule interacts with two general conditions on outputs in Pāli:

(1) Fully voiced consonants are pronounced with heightened subglottal pressure. Thus, the second consonant becomes aspirated as well as voiced.

(2) Sibilants are voiceless and tense, regardless of position. Thus, Bartholomea's Law is confined in its application to non-continuant obstruents. Voiced aspirates are devoiced before *s* by a later rule.

Bartholomea's Law must follow Seṭ *i* Insertion since the past participle suffix must always begin with *t* after a *seṭ* root even if that root ends in a voiced aspirate. It also must follow Reversion of Palatals if we are to order Weakening of Voiced

Aspirate where we have. Otherwise, *jh* before *t* would change to *h* which is not a voiced aspirate.

22. *Voicing Assimilation*: An obstruent assimilates to a following obstruent in tenseness and voicing.

$$\left[+\text{obs}\right] \text{ —— } \left[\alpha\text{vcd}\right] \Big/ \text{ —— } \left[\begin{matrix}+\text{obs}\\ \alpha\text{vcd}\end{matrix}\right]$$

Examples:

1. uttarati 'crosses over' udatāri (3rd. sg. aor.)
2. uppatati 'arises' udapatta (3rd. sg. pret.)
3. uppajjati 'rises' udapādi (3rd. sg. aor.)
4. ucchindati 'breaks up' udacchida (3rd. sg. pret.)
5. bhuñjati 'eats' bhokkhati (3rd. sg. fut.)
6. chindati 'cuts off' checchati (3rd. sg. fut.)
7. bhindati 'splits off' bhecchati (3rd. sg. fut.)
8. labhati 'obtains' lacchati (3rd. sg. fut.)

Some more examples:

1. sarati 'flows' ussarati 'runs out'
2. dharati 'holds' uddharati 'takes away'
3. kantati 'cuts' ukkantati 'cuts out'
4. pajjati 'goes' uppajjati 'arises'

Some derivations:

	(1)	ud+tr+a+ti	ud+a+tr+i
Guṇa & Vṛddhi		ud+tar+a+ti	ud+a+tar+i
Voice Assim.		ut+tar+a+ti	——
		uttarati	*udatāri*
	(2)	ud+dhr+a+ti	
Regular Guṇa		ud+dhar+a+ti	
Voice Assim.		vacuous appl.	
		uddharati	

	(3) ud+knt+a+ti
Regular Guṇa	ud+kant+a+ti
Voice Assim.	ut+kant+a+ti
	(4) ud+pad+y+a+ti
Voice Assim.	ut+pad+y+a+ti
	(5) ud+chind+a+ti
Voice Assim.	ut+chind+a+ti
	(6) bhuj+sy+a+ti
Regular Guṇa	bhauj+sy+a+ti
Rever. of Pal.-A	bhaug+sy+a+ti
Mid Vow. Form.	bhog+sy+a+ti
Voice Assim.	bhok+sy+a+ti
	(7) chid+sy+a+ti
Regular Guṇa	chaid+sy+a+ti
Mid Vow. Form.	ched+sy+a+ti
Assim. of Fr. Cons.	ched^{z}+sy+a+ti
Voice Assim.	chet^{s}+sy+a+ti
	(8) bhid+sy+a+ti
Regular Guṇa	bhaid+sy+a+ti
Mid Vow. Form.	bhed+sy+a+ti
Assim. of Fr. Cons.	bhed^{z}+sy+a+ti
Voice Assim.	bhet^{s}+sy+a+ti
	(9) labh+sy+a+ti
Assim. of Fr. Cons.	lad^{z}h+sy+a+ti
Voice Assim.	lat^{s}h+sy+a+ti

This rule must follow Bartholomea's Law. See the following derivation:

	budh+ta
Voice Assim.	buth+ta
Barth. Law	———
Cons. Deasp.$^{\triangle}$	butta
	**butta*

	budh+ta
Barth. Law	budh+dha
Voice Assim.	vacuous
Cons. Deasp. △	bud+dha
	buddha

It also must follow Seṭ i Insertion. See the following derivation:

	ud+ta
Seṭ i Insert.	ud+ita
Voice Assim.	——
	udita
	ud+ta
Voice Assim.	ut+ta
Seṭ i Insert.	ut+ita
	**utita*

23. *Sibilization of Retroflex Stops*: A retroflex stop becomes a retroflex *ṣ* when followed by a dental *t*.

$$\begin{bmatrix} +\text{obs} \\ -\text{high} \\ -\text{grv} \\ +\text{flt} \end{bmatrix} \longrightarrow \begin{bmatrix} +\text{cnt} \\ +\text{str} \end{bmatrix} \Big/ \text{——} \begin{bmatrix} +\text{obs} \\ -\text{high} \\ -\text{grv} \\ -\text{cnt} \\ -\text{flt} \\ -\text{vcd} \end{bmatrix}$$

Examples:

1. yajati 'sacrifices' yiṭṭha (pple.)
2. pucchati 'asks' puṭṭha (pple.)
3. sajjati 'decorates' saṭṭha (pple.)
4. nasati 'destroys' naṭṭha (pple.)

Some derivations:

	(1)		(2)	
	ij+ta		pus+ch+ta	
Glide Insert.	yij+ta		——	
Rever. of Pal.-B	yiḍ+ta		pus+ṭ+ta	

s-Retrofl.	——	puṣ+ṭ+ta
Voice Assim.	yiṭ+ta	——
Sib. of Retrofl. Stop	yiṣ+ta	puṣ+ṣ+ta
Gem. Red.	——	puṣ+ta

	(3)	(4)
	saj+ta	naś+ta
Rever. of Pal.-B	saḍ+ta	naṭ+ta
Voice Assim.	saṭ+ta	——
Sib. of Retrofl. Stop	saṣ+ta	naṣ+ta

This rule must follow Reversion of Palatals to Retroflex Consonant since the newly derived *t* undergoes this rule. It also must follow Bartholomea's Law. See the following derivations:

	(1)	(2)
	lijh+ta	lijh+ta
Rever. of Pal.-B	liḍh+ta	liḍh+ta
Barth. Law.	liḍh+dha	liz+ta
Sib. of Retrofl. Stop	——	——

The form in (1) will eventually give *liḍḍha* and then *liḷha*. The form in (2) would eventually give **liṭṭha*.

24. *Retroflexion Assimilation* : A dental obstruent becomes retroflex after a retroflex consonant.

$$\begin{bmatrix} +\text{obs} \\ -\text{grv} \\ -\text{high} \end{bmatrix} \longrightarrow [\text{flt}] \; / \; \begin{bmatrix} +\text{obs} \\ +\text{flt} \end{bmatrix} \text{——}$$

Examples:

1. is 'wish' (root) iṭṭha (pple.)
2. krs 'plough' (root) kaṭṭha (pple.)
3. phus 'touch' (root) phuṭṭha (pple.)
4. ij 'sacrifice' (root) yiṭṭha (pple.)
5. pus 'ask' (root) puṭṭha (pple.)

6. saj 'let loose' (root) saṭṭha (pple.)
7. naś 'destroy' (root) naṭṭha (pple.)
8. lijh 'write' (root) līḷha (pple.)

Some derivations:

	(1) is+ta
s-Retrofl.	iṣ+ta
Retrofl. Assim.	iṣ+ṭa
	(2) krs+ta
s-Retrofl.	krṣ+ta
Syl. of Res.	krṣ+ta
Fate of Syl. Res.	kaṣ+ta
Retrofl. Assim.	kaṣ+ṭa
	(3) phus+ta
s-Retrofl.	phuṣ+ta
Retrofl. Assim.	phuṣ+ṭa
	(4) ij+ta
Glide Insert.	yij+ta
Rever. of Pal.-B	yiḍ+ta
Voice Assim.	yiṭ+ta
Sib. of Retrofl. Stop	yiṣ+ta
Retrofl. Assim.	yiṣ+ṭa
	(5) pus+ch+ta
Rever. of Pal.-B	pus+ṭ+ta
s-Retrofl.	puṣ+ṭ+ta
Sib. of Retrofl. Stop	puṣ+ṣ+ta
Gem. Red.	puṣ+ta
Retrofl. Assim.	puṣ+ṭa
	(6) saj+ta
Rever. of Pal.-B	saḍ+ta
Voice Assim.	saṭ+ta
Sib. of Retrofl. Stop	saṣ+ta
Retrofl. Assim.	saṣ+ṭa
	(7) naś+ta
Rever. of Pal.-B	naṭ+ta

Sib. of Retrofl. Stop	naṣ+ta
Retrofl. Assim.	naṣ+ṭa

(8) lijh+ta
liḍh+ta
liḍh+dha
liḍh+ḍha

Rever. of Pal.-B
Barth. Law
Retrofl. Assim.

This rule must follow Sibilization of Retroflex Stops since ṭ sibilizes before a dental *t* but not before retroflex *ṭ*. *ṭṭ* is very common within morphemes in Pāli and must not be affected by the Sibilization of Retroflex Stops rule. It must also follow Reversion of Palatals to Retroflex. Dentals which follow retroflexes derived from palatals become retroflex. It has to follow s-Retroflexion since retroflex *ṣ*, resulting from that rule, causes retroflex assimilation.

25. *Retroflex Lateralization* : Voiced retroflex stops, single or geminate, aspirated or unaspirated, become laterals intervocalically.

$$V \quad \begin{bmatrix} +\text{cns} \\ +\text{obs} \\ +\text{vcd} \\ -\text{cnt} \\ +\text{flt} \end{bmatrix} \quad V$$

1 2 3

SD: 1 2(2) 3
SC: 2 $\Longrightarrow$ -obs

Note that surface *ḍḍ* and *ḍḍh* occasionally appear intervocalically in Pāli, and, when they do appear, they are the result of Consonant Assimilation, a later rule, or sporadic retroflexion of dentals. Surface retroflex *ḍ* appears intervocalically in one word. It is a result of sporadic retroflexion of a dental. This rule must follow Retroflex Assimilation to change *ḍhḍh*, which comes from *ḍh+dh*, into *ḷhḷh*. It must also follow Bartholomea's Law since the later changes *t* to *dh* after *ḍh*.

Examples :

1. ḍayhati 'burns' viḷayhati 'burns up'
2. vahati 'carries' vūḷha (pple.)
3. gāhati 'plunges' gāḷha (pple.)
4. gūhati 'hides' gūḷha (pple.)
5. muyhati 'is stunned' (pass.) mūḷha (pple.)
6. mehati 'mingits' mīḷha (ppl.)
7. rohati 'climbs' rūḷha (pple.)

Some derivations:

	(1)	mijh+ta
Rever. of Pal.-B		miḍh+ta
Barth. Law		miḍh+dha
Retrofl. Assim.		miḍh+ḍha
Retrofl. Laterl.		miḷh+ḷha

	(2)	vi+ḍajh+y+a+ti
Weak. of Vcd. Asp.		vi+ḍah+y+a+ti
Retrofl. Laterl.		vi+ḷah+y+a+ti

26. *Liquid Dropping*: Flat liquids (r and ḷ) are dropped before another liquid, with compensatory lengthening of the preceding vowel.

$$V \begin{bmatrix} +\text{cns} \\ -\text{obs} \\ +\text{flt} \end{bmatrix} \begin{bmatrix} +\text{cns} \\ -\text{obs} \\ -\text{nas} \end{bmatrix}$$

$$1 \quad 2 \quad 3 \Longrightarrow 1 \quad [+\text{lng}] \quad 3$$

Examples:

1. rāga 'passion' sārāga 'affection'
2. rakkhati 'protects' sārakkhati 'guards'

Derivations:

	(1)	sam+rāga
Nas. Assim. to Liq.		sar+rāga
Liquid Drop.		sā+rāga
		sārāga

	(2)	mijh+ta
Rever. of Pal.-B		miḍh+ta
Barth. Law		miḍh+dha
Retrofl. Assim.		miḍh+ḍha
Retrofl. Laterl.		miḷh+ḷha
Liquid Drop.		mī+ḷha
		miḷha

This rule must follow Retroflex Lateralization since retroflex liquids, derived from retroflex stops, undergo this rule. It must also follow Nasal Assimilation to liquids since *Vmr* must give *Vrr* and then $\bar{V}r$.

27. *Dropping of Final Consonants*: Nonnasal consonants are dropped at the end of a word.

$$\begin{bmatrix} +\text{cns} \\ -\text{nas} \end{bmatrix} / \quad \longrightarrow \phi \quad / \quad \text{———} \quad \#$$

Examples :

1. viharaṃ 'abiding' (nom. sg. ppr.)
   viharantaṃ (acc. sg. ppr.)
2. jānaṃ 'knowing' (nom. sg. ppr.)
   jānantehi (abl. sg. ppr.)
3. passaṃ 'seeing' (nom. sg. ppr.)
   passantā (nom. pl. ppr.)
4. vicaraṃ 'wandering' (nom. sg. ppr.)
   vicarantā (nom. pl. ppr.)

Some derivations :

	(1)	viharant+ϕ
Drop of Final Cons.		viharan

	(2)	pasyant+ϕ (sg.)	pasyanta (pl.)
Vowel Length. in pl.		———	pasyantā
Drop of Final Cons.		pasyan	

This rule has to follow Unnatural Sandhi Generalization; otherwise, word final *s* will be dropped by this rule giving **a*, instead of *o*.

28. *Vowel Nasalization*: A vowel is nasalized when followed by a nasal consonant which is immediately followed by a continuant obstruent or word boundary.

$$V \quad N \quad \left\{ \begin{bmatrix} +\text{obs} \\ +\text{cnt} \end{bmatrix} \right\} \quad \#$$

$$1 \quad 2 \quad 3 \quad \Longrightarrow \quad 1 \quad 3$$

$$[+\text{nas}]$$

Examples :

1. jānaṃ 'knowing' (nom. sg. ppr.)
2. vicaraṃ 'wandering' (nom. sg. ppr.)
3. haṃsati 'bristles' haṭṭha (pple.)

Some derivations :

	(1)		
		hrn+s+a+ti	hrs+ta
s-Retrofl.		———	hrṣ+ta
n-Retrofl.		hrṇ+s+a+ti	———
Syl. of Res.		hr̥ṇ+s+a+ti	hṛṣ+ta
Fate of Śyl. Res.		haṇ+s+a+ti	haṣ+ta
Vowel Nasal.		haṃ+s+a+ti	———
		haṃsati	

Note that inserted *n* does not undergo Syllabification of Resonants.

	(2)	
		jānant+ϕ
Drop of Final Cons.		jānan
Vowel Nasal.		jānaṃ
		jānaṃ

	(3)		(4)	
		vicarant+ϕ		pasyant +ϕ
Drop of Final Cons.		vicaran		pasyan
Vowel Nasal.		vicaraṃ		pasyaṃ
		vicaraṃ		*pasyaṃ*

Vowel Nasalization must follow Dropping of Final Consonant; otherwise, some Pāli words will have final nasals instead of nasalized vowels. See the following :

jānant+ϕ

Vowel Nasal. ———

Drop of Final Cons. jānan

**jānan*

29. *s-Softening* : A sibilant changes to *h* when followed or preceded by a consonant.

$$\begin{bmatrix} +\text{obs} \\ +\text{cnt} \end{bmatrix} \longrightarrow \begin{bmatrix} -\text{cns} \\ -\text{obs} \\ +\text{grv} \\ -\text{str} \\ \propto\text{vcd} \end{bmatrix} \; / \; \begin{bmatrix} +\text{cns} \\ \propto\text{ved} \end{bmatrix}$$

Examples :

1.	kamati	'walks' :	kamimha	(1st. pl. aor.)
			kamittha	(2nd. pl. aor.)
			kamisuṃ	(3rd. pl. aor.)
			or kamiṃsu	
2.	pajjati	'is produced'	nipphajjati	'springs forth'
3.	patati	'falls'	nipphatati	'falls out'
4.	sāsati	'teaches'	sattha	(pple.)

Some derivations :

	(1) kam+is+ma	kam+is+um	kam+is+ta
Vowel Nas.	———	kam+is+uṃ	———
s-Soften.	kam+ih+ma	———	kam+ih+ta
		kamisuṃ	

(2) nis+pad+y+a+ti

s-Soften. nih+pad+y+a+ti

(3) nis+kam+a+ti

s-Soften. nih+kam+a+ti

(4) sās+ta

s-Soften. sāh+ta

Some previous derivations carried further :

(5) is+ta

s-Retrofl. iṣ+ta

Retrofl. Assim. iṣ+ṭa

s-Soften. ih+ṭa

(6) īp+s+a+ti

Assim. of Fr. Cons. $īt^{s}$+s+a+ti

s-Soften. $īt^{s}$+h+a+ti

(7) gup+s+a+ti

Reduplication. ji+gup+s+a+ti

Assim. of Fr. Cons. ji+gut^{s}+s+a+ti

s-Soften ji+gut^{s}+h+a+ti

(8) ghas+s+a+ti

Reduplication ji+ghas+s+a+ti

s-Dissim. ji+ghat+s+a+ti

Assim. of Fr. Cons. ji+$ghat^{s}$+s+a+ti

s-Soften. ji+$ghat^{s}$+h+a+ti

(9) chid+sy+a+ti

Regular Guṇa chaid+sy+a+ti

Mid Vow. Form. ched+sy+a+ti

Assim. of Fr. Cons. $ched^{z}$+sy+a+ti

Voice Assim. $chet^{s}$+sy+a+ti

s-Soften. $chet^{s}$+hy+a+ti

(10) bhid+sy+a+ti

Regular Guṇa bhaid+sy+a+ti

Mid Vow. Form. bhed+sy+a+ti

Assim. of Fr. Cons. $bhed^{z}$+sy+a+ti

Voice Assim. $bhet^{s}$+sy+a+ti

s-Soften. $bhet^{s}$+hy+a+ti

(11) labh+sy+a+ti

Assim. of Fr. Cons. lad^{z}h+sy+a+ti

Voice Assim. lat^{s}h+sy+a+ti

s-Soften. lat^{s}h+hy+a+ti

(12) us+sy+a+ti
uas+sy+a+ti
was+sy+a+ti
wat^{s}+sy+a+ti
wat^{s}+hy+a+ti

Regular Guṇa
Glide Form.
Assim. of Fr. Cons.
s-Soften.

(13) bhuj+sy+a+ti
bhauj+sy+a+ti
bhaug+sy+a+ti
bhog+sy+a+ti
bhok+sy+a+ti
bhok+hy+a+ti

Regular Guṇa
Rever. of Pal.-A
Mid Vow. Form.
Voice Assim.
s-Soften.

This rule must follow Vowel Nasalization and Retroflex Assimilation; otherwise, *ns* would give *nh* instead of nasalization plus *s*. It must also follow Retroflex Assimilation; otherwise, *ʂ* will change to *h*, thus taking away the environment necessary for the retroflexion of *t*.

30. *Metathesis* : When the glide *h* is followed by a consonant, metathesis takes place.

$$\begin{bmatrix} -\text{cns} \\ -\text{syl} \\ -\text{high} \end{bmatrix} \quad \text{C} \qquad\qquad 1 \quad 2 \Longrightarrow 2 \quad 1$$

Examples :

1. sahati 'conquers' sayha (ger.)
2. vahati 'carries' vuyhati (pass.)
3. gaṇhāti 'takes' gayha (ger.)
4. ḍahati 'burns' ḍayha (ger.)
5. kamati 'walks' kamimha (aor. 1st. pl.)
6. juvhati 'sacrifices' hūta (pple.)

This rule takes *h*'s out of a prior position, and puts them in a posterior position, thus producing a natural sequence. The most natural thing to occur after *h* is a vowel. The sequence, *h* plus a consonant, though common in Skt. (brahma, suhma, √hve etc.), is not a very natural sequence. For example, in many

dialects of English *h* is dropped from the sequence *hw*. In Marathi, when a morpheme ends with an *h* and the following morpheme begins with a consonant, a vowel is inserted.

Some derivations:

	(1) sajh+ya
Weak. of Vcd. Asp.	sah+ya
Metathesis	say+ha
	sayha
	(2) ujh+y+a+ti
Glide Insert.	wujh+y+a+ti
Weak. of Vcd. Asp.	wuh+y+a+ti
Metathesis	wuy+h+a+ti
	(3) grjh+nā+ti
n-Retrofl.	gṛjh+ṇā+ti
Syl. of Res.	gr̥jh+ṇā+ti
Fate of Syl. Res.	gajh+ṇā+ti
Weak. of Vcd. Asp.	gah+ṇā+ti
Metathesis	gaṇ+hā+ti
	gaṇhāti
	(4) kam+is+ma
s-Retrofl.	kam+iṣ+ma
s-Soften.	kam+ih+ma
Metathesis	kam+im+ha
	kamimha
	(5) iṡ+ta
s-Retrofl.	iṣ+ta
Retrofl. Assim.	iṣ+ṭa
s-Soften.	ih+ṭa
Metathesis	iṭ+ha
	(6) krs+ta
s-Retrofl.	krṣ+ta
Syl. of Res.	kr̥ṣ+ta
Fate of Syl. Res.	kaṣ+ta
Retrofl. Assim.	kaṣ+ṭa

s-Soften.	kah+ṭa
Metathesis	kaṭ+ha

(7) ij+ta

Glide Insert.	yij+ta
Rever. of Pal.-B	yiḍ+ta
Voice Assim.	yiṭ+ta
Sib. of Retrofl. Stop.	yiṣ+ta
Retrofl. Assim.	yiṣ+ṭa
s-Soften.	yih+ṭa
Metathesis	yiṭ+ha

(8) pus+ch+ta

Rever. of Pal.-B	pus+ṭ+ta
s-Retrofl.	puṣ+ṭ+ta
Sib. of Retrofl. Stop.	puṣ+ṣ+ṭa
Gem. Red.	puṣ+ṭa
s-Soften.	puh+ṭa
Metathesis	puṭ+ha

(9) saj+ta

Rever. of Pal.-B	saḍ+ta
Voice Assim.	saṭ+ta
Sib. of Retrofl. Stop.	saṣ+ta
Retrofl. Assim.	saṣ+ṭa
s-Soften.	sah+ṭa
Metathesis	saṭ+ha

(10) naś+ta

Rever of. Pal-B	naṭ+ta
Sib. of Retrofl. Stop.	naṣ+ta
Retrofl. Assim.	naṣ+ṭa
s-Soften.	nah+ṭa
Metathesis	naṭ+ha

(11) kam+is+ta

s-Soften	kam+ih+ta
Metathesis	kam+it+ha

(12) nis+pad+y+a+tī

s-Soften.	nih+pad+y+a+tī
Metathesis	nip+had+y+a+ti

	(13) nis+kam+a+ti
s-Soften.	nih+kam+a+ti
Metathesis	nik+ham+a+ti

	(14) sās+ta
s-Soften.	sāh+ta
Metathesis	sāt+ha

This rule must follow s-Softening. The glide *h*, which comes from *s* by s-Softening, metathesizes with the following consonant. If Metathesis is ordered before s-Softening, we would get the following form:

	is+ta
s-Retrofl.	iṣ+ta
Retrofl. Assim.	iṣ+ṭa
Metathesis	——
s-Soften.	ih+ṭa
	**ihṭa*

but	is+ta
s-Retrofl.	iṣ+ta
Retrofl. Assim.	iṣ+ṭa
s-Soften.	ih+ṭa
Metathesis	iṭ+ha
h-Assim. △	iṭ+ṭha
	iṭṭha

It also has to follow Weakening of Voiced Aspirates. There are two sources of *h* in Pāli: *s* before or after a consonant, and *jh*. *h*'s from both sources must metathesize with following consonants.

31. *i-Insertion Between r and y*: *i* is inserted between *r* and *y*.

$$\phi \rightarrow \begin{bmatrix} -\text{cns} \\ +\text{syl} \\ -\text{grv} \\ +\text{high} \end{bmatrix} \Big/ \begin{bmatrix} +\text{cns} \\ -\text{obs} \\ +\text{cnt} \\ -\text{nas} \end{bmatrix} \text{——} \begin{bmatrix} -\text{cns} \\ -\text{syl} \\ -\text{grv} \\ +\text{high} \end{bmatrix}$$

Examples:

1. ā-hanati 'strikes' pariyāhata (pple.)
2. uṭṭhāti 'stands up' pariyuṭṭhāti 'arises'
3. karoti 'does' karīyati (pass.)
   kayirati

Some derivations:

	(1) kr+y+a+ti
Regular Guṇa	kar+y+a+ti
i-Insert.	kariy+a+ti
	kariyati → *kayirati*
	(2) pari+ā+hn+ta
Syl. of Res.	pari+ā+hn+ta
Fate of Syl. Res.	pari+ā+hå+ta
Glide Form.	pary+ā+ha+ta
i-Insert.	pariy+ā+ha+ta
	pariyāhata

This rule must follow Glide Formation since the latter rule often creates the *y* before which *i* is inserted.

32. *Palatalization* : Dental and Retroflex stops and nasals become palatals before the glide *y*.

$$\begin{bmatrix} \begin{Bmatrix} +\text{obs} \\ +\text{nas} \end{Bmatrix} \\ -\text{grv} \\ -\text{cnt} \end{bmatrix} \longrightarrow \begin{bmatrix} +\text{high} \\ -\text{flt} \end{bmatrix} \Big/ \text{—} \begin{bmatrix} -\text{cns} \\ -\text{syl} \\ +\text{high} \\ -\text{grv} \end{bmatrix}$$

Examples:

1. hanati 'kills' haññati 'is killed'
2. bodheti 'to enlighten' bujjhati 'to be awakened'
3. eti 'goes' acceti 'elapses'
4. uṇha 'hot' accuṇha 'very hot'
5. vadati 'speaks' vajjati 'is spoken'
6. odaka 'water' accodaka 'too much water'
7. adhibhavati 'conquers' ajjhabhavi (3rd. sg. aor.)

8. adhibhāseti 'addresses' ajjhabhāsi (3rd. sg. aor.)
9. āgacchati 'return' paccāgacchati 'return again'

The prefix *ud* is an exception to the rule. Its *d* is never palatalized but, rather, assimilates completely to a following *y*. See the following example:

yāti 'goes' — uyyāti 'goes out'
paccuyyāti 'goes out against'

Some derivations:

(1) hn+y+a+ti
Regular Guṇa — han+y+a+ti
Palatal. — hañ+y+a+ti

(2) budh+y+a+ti
Palatal. — bujh+y+a+ti

(3) ati+i+a+ti
Regular Guṇa — ati+ai+a+ti
Glide Form. — aty+ay+a+ti
Coales. of Gl. with Vowels — aty+e+ti
Palatal. — acy+e+ti

(4) ud+y+a+ti
Sampr. Guṇa — uad+y+a+ti
Glide Form. — wad+y+a+ti
Palatal. — waj+y+a+ti

(5) adhi+a+bhās+i
Glide From. — adhy+a+bhās+i
Palatal. — ajhy+a+bhās+i

(6) ā+han+sy+am
Vowel Nasal. — ā+han+sy+aṃ
s-Soften. — ā+han+hy+aṃ
Metathesis — ā+han+yh+aṃ
Palatal. — ā+hañ+yh+aṃ

(7) paṭi+ud+i+a+ti
Sampr. Guṇa — paṭi+ud+ia+a+ti
Like Vow. Coales. — paṭi+ud+iā+ti
Glide Form. — paṭy+ud+yā+ti
Palatal. — pacy+ud+yā+ti

Note, *ud* is an exception to Palatalization.

Palatalization must follow Glide Formation. If *y* is the result of Glide Formation, it causes Palatalization. It must also follow Weakening of Voiced Aspirates to prevent *jh*, which has come from *dh* before *y*, from turning into *h*.

33. *y-Assimilation*: The glide *y*, when preceded by a consonant, gets completely assimilated to it.

$$C \begin{bmatrix} -\text{cns} \\ -\text{syl} \\ -\text{grv} \\ +\text{high} \end{bmatrix}$$

$$1 \qquad 2 \qquad \rightarrow \qquad 1 \qquad 1$$

Examples:

1. dis 'see' (root) dissati (3rd. sg. pass.)
2. us 'dwell' (root) vussati (3rd. sg. pass.)
   vacchati (3rd. sg. fut.)
3. han 'kill' (root) haññati (3rd. sg. pass.)
4. uc 'say' (root) vuccati (3rd. sg. pass.)
   vakkhati (3rd. sg. fut.)
5. bhuj 'eat' (root) bhokkhati (3rd. sg. fut.)
6. hā 'abandon' (root) hessati (3rd. sg. fut.)

Some more examples :

1. okirati 'pours down' abbhokirati 'sprinkles'
2. udīreti 'utters' abbhudīreti 'voices'
3. anumodati 'is pleased' abbhanumodati 'much pleased'

Some derivations :

(1) abhi+okirati
Glide Form. abhy+okirati
y-Assim. abhbh+okirati

(2) abhi+anu+mud+a+ti
Regular Guṇa abhi+anu+maud+a+ti
Glide Form. abhy+anu+maud+a+ti

Mid Vow. Form.	abhy+anu+mod+a+ti
y-Assim.	abhbh+anu+mod+a+ti
	(3) us+y+a+ti
Glide Insert.	wus+y+a+ti
y-Assim.	wus+s+a+ti
	(4) han+y+a+ti
Palatal.	hañ+y+a+ti
y-Assim.	hañ+ñ+a+ti
	*hañña*ti
	(5) uc+y+a+ti
Glide Insert.	wuc+y+a+ti
y-Assim.	wuc+c+a+ti
	(6) uc+sy+a+ti
Sampr. Guṇa	uac+sy+a+ti
Rever. of Pal.-A	uak+sy+a+ti
Glide Form.	wak+sy+a+ti
s-Soften.	wak+hy+a+ti
Metathesis	wak+yh+a+ti
y-Assim.	wak+kh+a+ti
	(7) bhuj+sy+a+ti
Regular Guṇa	bhauj+sy+a+ti
Rever. of Pal.	bhaug+sy+a+ti
Mid Vow. Form.	bhog+sy+a+ti
Voice Assim.	bhok+sy+a+ti
s-Soften.	bhok+hy+a+ti
Metathesis	bhok+yh+a+ti
y-Assim.	bhok+kh+a+ti
	(8) wiś—sy+a+ti
Regular Guṇa	waiś+sy+a+ti
Rever. of Pal.-A	waik+sy+a+ti
s-Soften.	waik+hy+a+ti
Metathesis	waik+yh+a+ti
y-Assim.	waik+kh+a+ti
	(9) us+sy+a+ti
Sampr. Guṇa	uas+sy+a+ti

Glide Form.	was+sy+a+ti
s-Dissim.	wat+sy+a+ti
Assim. of Fr. Cons.	wat^{s} +sy+a+ti
s-Soften.	wat^{s}+hy+a+ti
Metathesis	wat^{s}+yh+a+ti
y-Assim.	wat^{s}+t^{s}h+a+ti

(10) diū+y+a+ti

Glide Form.	diw+y+a+ti
y-Assim.	diw+w+a+ti

(11) hū+isy+a+ti

Regular Guṇa	haū+isy+a+ti
Glide Form.	haw+isy+a+ti
The Drop of Inter. w	ha+isy+a+ti
Mid Vow. Form.	he+sy+a+ti
y-Assim.	he+ss+a+ti

(12) budh+y+a+ti

Palatal.	bujh+y+a+ti
y-Assim.	bujh+jh+a+ti

(13) ati+i+a+ti

Regular Guṇa	ati+ai+a+ti
Glide Form.	aty+ay+a+ti
Coales. of Gl. with Vowels	aty+e+ti
Palatal.	acy+e+ti
y-Assim.	acc+e+ti
	acceti

(14) ud+y+a+ti

Sampr. Guṇa	uad+y+a+ti
Glide Form.	wad+y+a+ti
Palathal.	waj+y+a+ti
y-Assim.	waj+j+a+ti

(15) adhi+a+bhās+i

Glide Form.	adhy+a+bhās+i
Palatal.	ajhy+a+bhās+i
y-Assim.	ajhjh+a+bhās+i

(16) paṭi+ud+i+a+ti

Sampr. Guṇa — paṭi+ud+ia+a+ti
Like Vow. Coales. — paṭi+ud+iā+ti
Glide Form. — paṭy+ud+yā+ti
Palatal. — pacy+ud+yā+ti
y-Assim. — pacc+ud+yā+ti

The prefix *ud* is an exception to Palatalization and y-Assimilation.

To arrive at the correct form, such as *hañ̃ati*, y-Assimilation must follow Palatalization. It must also follow s-Dissimilation; ctherwise, newly derived *s* will become the environment for the operation of the s-Dissimilation rule. For example :

bhās+y+a+ti

y-Assim. — bhās+s+a+ti
s-Dissim. — bhāt+s+a+ti

**bhatsati* (by the later rule, Vow. Shorten.)

The correct form :

bhās+y+a+ti

s-Dissim. — ——
y-Assim. — bhās+s+a+ti

bhassati (by the later rule, Vow. Shorten.)

y-Assimilation must also follow Glide Formation, Metathesis, and i-Insertion. Compare the following derivations:

(1) abhi+ā+gata

y-Assim. — ——
Glide Form. — abhy+ā+gata

**abhyāgata*

The correct form :

abhi+ā+gata

Glide Form. — abhy+ā+gata
y-Assim. — abhbh+ā+gata
Cons. Deasp.△ — abbh+ā+gata

abbhāgata

(2) grjh+ya

Syl. of Res. grjh+ya

Fate of Syl. Res. gajh+ya

Weak. of Vcd. Asp. gah+ya

y-Assim. gah+ha

Metathesis ——

*gahha

The correct form :

Syl. of Res. grjh+ya

Fate of Syl. Res. grjh+ya

Weak. of Vcd. Asp. gajh+ya

Metathesis gah+ya

y-Assim. gay+ha

—

gayha

(3) kr+ya

Vṛddhi kār+ya

y-Assim. kār+ra

i-Insert. ——

Vowel Short.△ karra

*karra

The correct form :

Vṛddhi kr+ya

i-Insert. kār+ya

y-Assim. kār+i+ya

———

kāriya

34. *r-Assimilation* : When an *r* is preceded by a consonant, it completely assimilates to it.

$$\begin{array}{ccccccc} C & & \left[\begin{array}{l}+\text{cns}\\ -\text{obs}\\ +\text{cnt}\end{array}\right] & & & & \\ 1 & & 2 & \Longrightarrow & 1 & & 1 \end{array}$$

Examples :

1.	suṇāti	'hears'	assosi	(3rd. sg. aor.)
2.	gaṇhāti	'grasps'	aggahi	(3rd. sg. aor.)
3.	reka	'emission'	uddeka	'vomit' (noun)

Derivations :

	(1) sru+nā+ti	a+sru+s+i
Regular Guṇa	——	a+srau+s+i
n-Retrofl.	sru+ṇā+ti	——
Mid Vow Form.	——	a+sr+o+s+i
r-Assim.	ssu+ṇā+ti	a+ss+o+s+i
Gem. Red.	su+ṇā+ti	——
	suṇāti	*assosi*

	(2) grjh+nā+ti	a+grjh+i
Sampr. Guna	——	a+grajh+i
n-Retrofl.	grjh+ṇā+ti	——
Syl. of Res.	gr̥jh+ṇā+ti	——
Fate of Syl. Res.	gajh+ṇā+ti	——
Weak. of Vcd. Asp.	gah+ṇā+ti	a+grah+i
Metathesis	gaṇ+hā+ti	——
r-Assim.	——	a+ggah+i
	gaṇhāti	*aggahi*

r-Assimilation must follow n-Retroflexion; otherwise, *n*, in *suṇāti* and *gaṇhāti*, will not be retroflected. r-Assimilation must follow Nasal Assimilation to Liquids; otherwise *mr* will result in **mm* instead of *rr*. It must follow Guṇa and Vṛddhi, as well as Syllabification of Resonants. Guṇa and Vṛddhi insert a vowel between a consonant and *r*. This insertion must take place before *r* is assimilated. The *r* which appears between two consonants cannot be syllabified if it has already assimilated to the consonant which precedes it. r-Assimilation must also follow Prefix Vowel Nasalization. If a word is an exception to Nasal Assimilation to Liquids with the nasal at the end of a prefix, and if the root begins with *r*, the vowel preceding the nasal must be nasalized and the nasal must be dropped. The following example shows that Guṇa and Vṛddhi must precede r-Assimilation.

	pitr+am
r-Assim.	pitt+am
Guṇa and Vṛddhi	——
	**pittam*

The correct form :

	pitr+am
Regular Guṇa	pitar+am
Vowel Nas.	pitar+aṃ
r-Assim.	——
	pitaraṃ

35. *w-Assimilation* : When the glide *w* is preceded by voiced consonants or by the fricative *s*, it completely assimilates to them.

$$\begin{bmatrix} +\text{obs} \\ \{+\text{vcd} \\ +\text{cnt}\} \end{bmatrix} \quad \begin{bmatrix} -\text{cns} \\ -\text{syl} \\ +\text{grv} \\ +\text{high} \end{bmatrix}$$

$$1 \qquad 2 \qquad \Longrightarrow \qquad 1 \quad 1$$

Examples :

1-	sā	'dog'	(nom. sg. masc.)	suṇo	(gen. sg.)
2.	labh	'obtain'	(root)	laddhā	(grd.)

Derivations :

	(1)	labh+twā
Barth. Law		labh+dhwā
w-Assim.		labh+dhdhā
Gem. Red.		labh+dhā
	(2)	sun+ϕ
Sampr. Guṇa		suan
Drop of Nas. in Nom.		suā
Glide Form.		swā
w-Assim.		ssā
Gem. Red.		sā
		sā

Some dialects of Pāli did not have this rule; for example; the numeral "two" may appear as *dve*, *de*, or *be*. The last form

is the result of regressive rather than progressive assimilation. The prefix *ud* is exempt from this rule as it is from all other progressive assimilation rules. *ud* always assimilates regressively :

ud+y→uyy, not *ujj
ud+v→ubb, not *udd
ud+s→uss, not *ucch

This rule must follow Glide Formation since a derived *w* assimilates to the preceding consonant. It shoud be ordered after Weakening of Voiced Aspirates. Weakening of Voiced Aspirates produces *h* from *jh*. If w-Assimilation is ordered after Weakening of Voiced Aspirates, the derived *h* will not cause assimilation since *w* assimilates only to obstruents. Bartholomea's Law should precede w-Assimilation since *w* does not assimilate to voiceless consonant but, rather, to voiced ones and since Bartholomea's Law produces voiced *dh*, to which *w* assimilates, from *t*.

36. *Fricativization of w* : The glide *w* becomes either the bilabial fricative β or the labio-dental fricative *v*, depending on the dialect.

$$\begin{bmatrix} -\text{cns} \\ -\text{syl} \\ +\text{grv} \\ +\text{high} \end{bmatrix} \longrightarrow \begin{bmatrix} +\text{cns} \\ +\text{obs} \\ -\text{high} \\ -\text{flt} \\ \pm\text{str} \end{bmatrix}$$

Examples :

1. dibbati 'amuses oneself' jūta (pple.)
2. vasati 'lives' ubbasati 'to be out of one's home'
3. vacati 'speaks' vutta (pple.)

Derivations :

	(1) diū+y+a+ti
Glide Form.	diw+y+a+ti
y-Assim.	diw+w+a+ti
Fric. of w	div+v+a+ti
	(2) ud+us+a+ti
Sampr. Guṇa	ud+uas+a+ti

Glide Form.	ud+was+a+ti
d-Assim. (Irregular)	uw+was+a+ti
Fric. of w	uv+vas+a+ti

Note, *d* of the prefix *ud* irregularly assimilates to *w*.

	(3) uc+a+ti
Sampr. Guṇa	uac+a+ti
Glide Form.	wac+a+ti
Fric. of w	vac+a+ti
	vacati

The Fricativization of *w* is needed in the grammar of Pāli. Its occurrence is governed by the naturalness condition. The behavior of *u* before a vowel is essentially the same as the behavior of *i*. i→y and u→w are parallel; i→y and u→v are not. *w* assimilates to a preceding consonant just as *y* does. It is natural for *w* to be inserted before *u* since *w* and *u* differ in only one feature. All these processes or rules do exist in Pāli. But somewhere along the line of derivation, *w* needs to be changed to *v*. The rule vv→bb is more natural than ww→bb; #vy→#by is more natural than #wy→#by. Initial and geminate *v* changed to *b* in many Germanic languages, for example. To account for the fact that some derived *w*'s change to *b*'s, we must have the intermediate natural rule, w→v.

The rule w→v represents a natural and frequent sound change. It is attested as a historical process in Russian, German, Northern Dutch, and many Romance languages. The change from *w* to *v* often involves two intermediate forms : (1) ẅ and (2) β. *ẅ* is a glide very much like *w* and made with spread, rather than rounded, lips approaching each other but not coming into contact. β is voiced bilabial rather than labiodental fricative. All four have been, or are, found in Indic languages. Pre Skt. had *w*, Marathi has ẅ, which was probably the pronunciation in Vedic, Hindi has β, which probably existed in some Pāli dialects, and Singhalese and Panjabi have *v* the sound described by Pāli grammarian (dantoṭṭhaja).

w	ẅ	β	v
Pre Skt.	Mar.	Hindi	Singhalese

The obvious relationship between *w* and *v* should be accounted for by any adequate feature system. In Jakobson's feature system, *w* and *v* differ only by three features; cons, grv, and str; and each stage in the process w→v can be described as a change of only one feature. w→ẅ is a change from + flt to — flt. The change from ẅ→β is the change from — cns to + cns. The change from β to *v* is the change from —str to + str. In Chomsky and Halle's system, *w* and *v* have only three features in common out of nine. If the six features which separate the two segments were changed one at a time, many of the intermediate stages would be highly implausible. For example :

$$w \rightarrow \ddot{w} \rightarrow y \rightarrow \hat{\gamma} \rightarrow$$

$$[+\text{rnd}] \quad \begin{bmatrix} -\text{rnd} \\ +\text{back} \end{bmatrix} \quad \begin{bmatrix} -\text{rnd} \\ -\text{back} \\ -\text{cns} \end{bmatrix} \quad \begin{bmatrix} -\text{rnd} \\ -\text{back} \\ +\text{cns} \\ -\text{str} \\ +\text{hight} \\ -\text{ant} \end{bmatrix}$$

$$\beta^{y} \rightarrow \beta \rightarrow V$$

$$\begin{bmatrix} -\text{rnd} \\ -\text{back} \\ +\text{cns} \\ -\text{str} \\ +\text{high} \\ +\text{ant} \end{bmatrix} \quad \begin{bmatrix} -\text{rnd} \\ -\text{back} \\ +\text{cns} \\ -\text{str} \\ -\text{high} \\ +\text{ant} \end{bmatrix} \quad \begin{bmatrix} -\text{rnd} \\ -\text{back} \\ +\text{cns} \\ +\text{str} \\ -\text{high} \\ +\text{ant} \end{bmatrix}$$

($\hat{\gamma}$ is a fronted γ; a voiced palatal—not alveopalatal-fricative.)

Since *w* and *v* are both —voc, +cnt, and —cor, I have kept the feature values constant.

The feature diffuse indicates a natural relationship between *w* and *v*. However, it has several drawbacks. First, +dif and —dif do not define acoustic natural classes. High vowels typically have low second formants. This is also a characteristic of —dif consonants. Low vowels typically have high second formants. This is a characteristic of +dif consonant. McCawley's feature "buccal" and Chomsky and Halle's feature "high" do define natural acoustic classes. Sounds having first formants typical of high vowels are called +high. Sounds having

first formants typical of low vowels are called —high. Second, the feature diffuse makes the process, t→č/-i look like a dissimilation, whereas it is actually an assimilation. Finally, Uto-Aztecan languages have an assimilation rule s→š/-i, i̇ and u. š as opposed to *s* is pronounced with the body of the tongue coming into contact with the top of the mouth. In the pronunciation of *i*, i̇ and *u*, a part of the body of the tongue approaches the top of the mouth. The fricative *s* is sucked up by these vowels. I have chosen a system which is close to Jakobson's, but I have used high instead of diffuse and low instead of compact. It, unfortunately, slightly obscures the relationship between *w* and *v* but not nearly as badly as Chomsky and Halle's.

In terms of the three feature systems, w, ẅ, β and v are defined as follows :

Jakobson's feature system :

w	ẅ	β	v
−cns	−cns	+cns	+cns
−voc	−voc	−voc	−voc
+grv	+grv	+grv	+grv
+dif	+dif	+dif	+dif
+flt	−flt	−flt	−flt
+cnt	(+cnt)	+cnt	+cnt
(−str)	(−str)	−str	+str

Chomsky and Halle's feature system :

w	ẅ	β	v
−cns	−cns	+cns	+cns
−voc	−voc	−voc	−voc
+high	+high	−cor	−cor
+back	+back	+ant	+ant
+rnd	−rnd	+cnt	+cnt
(+cnt)	(+cnt)	−str	+str
(−cor)		−high	−high
(−ant)		−back	−back
(−str)		−rnd	−rnd

McCawley's feature system with a few changes :

w	ẅ	β	v
−cns	−cns	+cns	+cns
−obs	−obs	+obs	+obs
−syl	−syl	−syl	−syl
+grv	+grv	+grv	+grv
+high	+high	−high	−high
+flt	−flt	−flt	+flt
+cnt	+cnt	+cnt	+cnt
−str	−str	−str	+str

The rule, Fricativization of w, must follow Glide Formation since a derived *w* needs to be changed into a fricative. It should follow Coalescence of Glides with Vowels, since the latter rule coalesces the sequence *awa* into *o* and *aya* into *e*. If the order were reversed, a sequence of vowel plus obstruent plus vowel would have to be coalesced, and this development is unnatural. Besides, there would have to be two Coalescence rules, one to coalesce a sequence of vowel plus obstruent plus vowel and the other of vowel plus glide plus vowel. This is clearly inelegant and obscures a significant generalization. It must also follow the rule Drop of Intervocalic w. The Drop of Intervocalic w drops *w* between *a* and *i*. It is much more natural to drop a glide between two vowels rather than to drop an obstruent between two vowels, especially in a language where intervocalic obstruents do not drop.

Fricativization of w has to follow s-Softening. s-Softening produces *h* from *s* if *s* is preceded or followed by an obstruent. *sw* must give us *ss*; thus *s* may not soften before *w*. If *w* were changed to *v* before s-Softening took place, *s* would soften since *v* is an obstruent.

It must also follow w-Assimilation since *w* assimilates progressively, like a glide, rather than regressively, like an obstruent.

37. Palatalization of Affricates : All affricates are palatal affricates in Pāli.

$$\begin{bmatrix} +\text{obs} \\ -\text{cnt} \\ +\text{str} \end{bmatrix} \longrightarrow \begin{bmatrix} +\text{high} \\ -\text{grv} \end{bmatrix}$$

Examples :

1.	us	'dwell'	(root)	vacchati	(3rd. sg. fut.)
2.	īp	'desire'	(root)	icchati	(3rd. sg. des.)
3.	gup	'detest'	(root)	jigucchati	(3rd. sg. des.)
4.	chid	'cut off'	(root)	checchati	(3rd. sg. fut.)
5.	bhid	'split'	(root)	bhecchati	(3rd. sg. fut.)
6.	kit/cit	'think'	(root)	cikicchati	(3rd. sg. des.)
7.	labh	'obtain'	(root)	lacchati	(3rd. sg. fut.)

Some derivations :

	(1)	us+sy+a+ti
Sampr. Guṇa		uas+sy+a+ti
s-Dissim.		uat+sy+a+ti
Glide Form.		wat+sy+a+ti
Assim. of Fr. Cons.		wat^{s}+sy+a+ti
s-Soften.		wat^{s}+hy+a+ti
Metathesis		wat^{s}+yh+a+ti
y-Assim.		wat^{s}+t^{s}h+a+ti
Fric. of w		vat^{s}+t^{s}h+a+ti
Palatal. of Affr.		vac+ch+a+ti
		vacchati
	(2)	īp+s+a+ti
Assim. of Fr. Cons.		īt^{s}+s+a+ti
s-Soften.		īt^{s}+h+a+ti
Palatal. of Affr.		īc+h+a+ti
	(3)	gup+s+a+ti
Redupl.		ji+gup+s+a+ti
Assim. of Fr. Cons.		ji+gut^{s}+s+a+ti
s-Soften.		ji+gut^{s}+h+a+ti
Palatal. of Affr.		ji+guc+h+a+ti
	(4)	chid+sy+a+ti
Regular Guṇa		chaid+sy+a+ti
Mid Vow. Form.		ched+sy+a+ti
Assim. of Fr. Cons.		ched^{s}+sy+a+ti
Voice Assim.		chet^{s}+sy+a+ti
s-Soften.		chet^{s}+hy+a+ti

Metathesis	chet^{s}+yh+a+ti
y-Assim.	chet^{s}+t^{s}h+a+ti
Palatal. of Affr.	chec+ch+a+ti

(5) bhid+sy+a+ti

Regular Guṇa	bhaid+sy+a+ti
Mid Vow. Form.	bhed+sy+a+ti
Assim. of Fr. Cons.	bhed^{z}+sy+a+ti
Voice Assim.	bhet^{s}+sy+a+ti
s-Soften.	bhet^{s}+hy+a+ti
Metathesis	bhet^{s}+yh+a+ti
y-Assim.	bhets+t^{s}h+a+ti
Palatal. of Affr.	bhec+ch+a+ti

(6) kit+s+a+ti

Redupl.	ci+kit+s+a+ti
Assim. of Fr. Cons.	ci+kit^{s}+s+a+ti
s-Soften.	ci+kit^{s}+h+a+ti
Palatal. of Affr.	ci+kic+h+a+ti

(7) labh+sy+a+ti

Assim. of Fr. Cons.	lad^{z}h+sy+a+ti
Voice Assim.	lat^{s}h+sy+a+ti
s-Soften.	lat^{s}h+hy+a+ti
Metathesis	latsh+yh+a+ti
y-Assim.	latsh+t^{s}hh+a+ti
Gem. Red.	lat^{s}h+h+a+ti
Palatal. of Affr.	lach+h+a+ti

This rule must follow Assimilation of Front Consonants to *s* since the latter creates nonpalatal affricates, which are outside the Pāli system, and this rule brings them back into the system. In effect, this is a redundancy rule which must be ordered after a phonological rule.

38. *Shortening of Nasalized Vowels* : Nasalized vowels are always short.

$$\begin{bmatrix} V \\ +nas \end{bmatrix} \longrightarrow \begin{bmatrix} -lng \end{bmatrix}$$

Examples :

1.	kaññā	'girl'	(nom. sg.)	kaññaṃ	(acc. sg.)
2.	nadī	'river'	(nom. sg.)	nadiṃ	(acc. sg.)
3.	sassū	'mother-in-law'	(nom. sg.)	sassuṃ	(acc. sg.)

Derivation :

	nadī+m
Vow. Nasal.	nadī+ṃ
Short. of Nas. Vow.	nadi+ṃ
	nadiṃ

For obvious reasons, this rule must follow Vowel Nasalization and Prefix Vowel Nasalization.

39. *Progressive Nasal Assimilation* : A nasal consonant when preceded by a grave consonant completely assimilates to it.

$$\begin{bmatrix} C \\ \\ +grv \end{bmatrix} \quad \begin{bmatrix} +cns \\ +nas \end{bmatrix}$$

$$1 \qquad 2 \Longrightarrow 1 \; 1$$

Examples :

1.	sak	'be able'	(root)	sakkoti	(3rd. sg. pres.)
2.	āp	'obtain'	(root)	appoti	(3rd. sg. pres.)

Derivation :

	sak+no+ti
Prog. Nasal Assim.	sak+ko+ti
	sakkoti

Compare : rājn+ā (abl. sg.) ⟶ raññā
bhid+na (pple.) →bhinna

Note, the voicing of the preceding consonant has nothing to do with this rule. Skt. *agni* > Pāli *aggi*

40. *h-Assimilation* : When *h* is preceded by a stop or an affricate, if either is immediately preceded by a vowel, it changes to the aspirated version of that stop or affricate.

$$V \quad \begin{bmatrix} +obs \\ -cnt \end{bmatrix} \qquad \begin{bmatrix} -cns \\ -syl \\ -high \end{bmatrix} \qquad 2$$

$$1 \qquad 2 \qquad 3 \Longrightarrow 1\ 2\ [+H.S.P.]$$

Examples :

1.	īp	'wish'	(root)	icchati	(3rd. sg. des.)
2.	gup	'detest'	(root)	jigucchati	(3rd. sg. des.)
3.	ghas	'eat'	(root)	jighacchati	(3rd. sg. des.)
4.	kit	'think'	(root)	cikicchati	(3rd. sg. des.)
5.	sak	'be able'	(root)	sakkhi	(3rd. sg. aor.)

Some derivations :

(1) īp + s + a + ti

Redupl.	ī + īp + s + a + ti
Like Vow. Coales.	īp + s + a + ti
Assim. of Fr. Cons.	$īt^s$ + s + a + ti
s-Soften.	$īt^s$ + h + a + ti
Palatal. of Affr.	īc + h + a + ti
h-Assim.	īc + ch + a + ti

(2) gup + s + a + ti

Redupl.	ji + gup + s + a + ti
Assim. of Fr. Cons.	ji + gut^s + s + a + ti
s-Soften.	ji + gut^s + h + a + ti
Palatal. of Affr.	ji + guc + h + a + ti
h-Assim.	ji + guc + ch + a + ti

jigucchati

(3) ghas + s + a + ti

Redupl.	ji + ghas + s + a + ti
s-Dissim.	ji + ghat + s + a + ti
Assim. of Fr. Cons.	ji + $ghat^s$ + s + a + ti
s-Soften.	ji + $ghat^s$ + h + a + ti
Palatal. of Affr.	ji + ghac + h + a + ti
h-Assim.	ji + ghac + ch + a + ti

jighacchati

(4) kit + s + a + ti

Redupl.	ci + kit + s + a + ti

Assim. of Fr. Cons.	ci + kit^{s} + s + a + ti
s-Soften.	ci + kit^{s} + h + a + ti
Palatal. of Affr.	ci + kic + h + a + ti
h-Assim.	ci + kic + ch + a + ti
	cikicchati

(5) sak + s + i

s-Soften.	sak + h + i
h-Assim.	sak + kh + i

(6) phus + ta

s-Retrofl.	phuṣ + ta
Retrofl. Assim.	phuṣ + ṭa
s-Soften.	phuh + ṭa
Metathesis	phuṭ + ha
h-Assim.	phuṭ + ṭha
	phuṭṭha

(7) is + ta

s-Retrofl.	iṣ + ta
Retorfl. Assim.	iṣ + ṭa
s-Soften.	ih + ṭa
Metathesis	iṭ + ha
h-Assim.	iṭ + ṭha
	iṭṭha

(8) krs + ta

s-Retrofl.	krṣ + ta
Syl. of Res.	krṣ + ta
Fate of Syl. Res.	kaṣ + ta
Retrofl. Assim.	kaṣ + ṭa
s-Soften.	kah + ṭa
Metathesis	kaṭ + ha
h-Assim.	kaṭ + ṭha
	kaṭṭha

(9) ij + ta

Glide Insert.	yij + ta
Rever. of Pal. -B	yiḍ + ta

Voice Assim. yiṭ + ta
Sib. of Retrofl. Stop yiṣ + ta
Retrofl. Assim. yiṣ + ṭa
s-Soften. yih+ ṭa
Metathesis yiṭ + ha
h-Assim. yiṭ + ṭha
yiṭṭha

(10) pus + ch + ta

Rever. of Pal.-B pus + ṭ + ta
s-Retrofl. puṣ + ṭ + ta
Sib. of Retrofl. Stop puṣ + ṣ + ta
Gem. Red. puṣ + ta
Retrofl. Assim. puṣ + ṭa
s-Soften. puh + ṭa
Metathesis puṭ + ha
h-Assim. puṭ + ṭha
puṭṭha

(11) saj + ta

Rever. of Pal. -B saḍ+ ta
Voice Assim. saṭ -+ ta
Sib. of Retrofl. Stop saṣ + ta
Retrofl. Assim. saṣ + ṭa
s-Soften. sah+ ṭa
Metathesis saṭ + ha
h-Assim. saṭ + ṭha
saṭṭha

(12) naś + ta

Rever. of Pal.-B naṭ + ta
Sib. of Retrofl. Stop naṣ + ta
Retrofl. Assim. naṣ + ṭa
s-Soften. nah + ṭa
Metathesis naṭ + ha
h-Assim. naṭ + ṭha
naṭṭha

(13) kam + is+ta

s-Retrofl. kam + iṣ + ta

s-Soften.	kam + ih + ta
Metathesis	kam + it + ha
h-Assim.	kam + ittha
	kamittha

(14)

	nis + pad + y + a + ti
s-Retrofl.	niṣ + pad + y + a + ti
s-Soften.	nih + pad + y + a + ti
Metathesis	nip + had + y + a + ti
Palatal.	nip + haj + y + a + ti
y-Assim.	nip + haj + j + a + ti
h-Assim.	nip + phaj + j + a + ti
	nipphajjatti

(15)

	sās + ta
s-Soften.	sāh + ta
Metathesis	sāt + ha
h-Assim.	sāt + tha

This rule must follow Metathesis. The Metathesis rule metathesizes *h* with an obstruent. That is to say, the *h* which precedes a consonant is moved to the right of an obstruent. This moved *h* copies the preceding consonant. Therefore, the order must be Metathesis and then h-Assimilation. See the following derivation :

	is + ta
s-Retrofl.	iṣ + ta
Retrofl. Assim.	iṣ + ṭa
s-Soften.	ih + ṭa
Metathesis	iṭ + ha
h- Assim.	iṭ + ṭha
	iṭṭha

	is + ta
s-Retrofl.	iṣ + ta
Retrofl. Assim.	iṣ + ṭa
s-Soften.	ih + ṭa
h-Assim.	—
Metathesis	iṭ + ha
	**iṭha*

This rule must follow s-Softening because s-Softening produces the *h*'s that are assimilated.

41. *Consonant Assimilation* : When a non-nasal consonant is followed by another consonant, the first consonant assimilates to the second.

$$\begin{matrix} C \\ [\text{-nas}] \\ 1 \end{matrix} \quad \begin{matrix} C \\ \\ 2 \end{matrix} \quad \Longrightarrow \quad 2 \quad 2$$

Examples :

1.	jala	'water'	nijjala	'without water'	
2.	rājānaṃ	'king'	(acc. sg.)	raññā	(abl. sg.)
3.	muc	'make free'	(root)	mutta	(pple.)
4.	bhaj	'love'	(root)	bhatta	(pple.)
5.	tap	'shine'	(root)	tatta	(pple.)
6.	chid	'break'	(root)	chinna	(pple.)
7.	lap	'mutter'	(root)	ullapati	'calls out'
8.	uttarati	'crosses over'	(3rd. sg. pres.)	udatāri (3rd. sg. aor.)	
9.	sarati	'flows'	(3rd. sg. pres.)	ussarati 'runs away'	
10.	patati	'falls'	(3rd. sg. pres.)	uppatati 'flies up'	
11.	yāti	'goes'	(3rd. sg. pres.)	uyyāti 'goes away'	
12.	dharati	'holds'	(3rd. sg. pres.)	uddharati 'removes'	
13.	namati	'bends'	(3rd. sg. pres.)	unnamati 'rises up'	
14.	pajjati	'goes'	(3rd. sg. pres.)	uppajjati 'goes out'	

Some derivations :

(1) ud + sarati
Voice Assim. ut + sarati
Cons. Assim. us + sarati
ussarati

(2) ud + pad + y + a + ti
Voice Assim. ut + pad + y + a + ti
Palatal. ut + paj + y + a + ti
y-Assim. ut + paj + j + a + ti
Cons. Assim. up + paj + j + a + ti
uppajjati

(3) ud + namati
vacuous
Voice Assim. un + namati
Cons. Assim. *unnamati*

(4) muc + ta
Rever. of Pal.-A muk + ta
Cons. Assim. mut + ta
mutta

(5) ij + ta
Glide Insert. yij + ta
Rever. of Pal.-B yiḍ + ta
Voice Assim. yiṭ + ta
Sib. of Retrofl. Stop yiṣ + ta
Retrofl. Assim. yiṣ + ṭa
s-Soften. yih + ṭa
Metathesis yiṭ + ha
h-Assim. yiṭ + ṭha
Cons. Assim. vacuous
yiṭṭha

(6) uc + ta
Glide Insert. wuc + ta
Rever. of Pal.-B wuk + ta
Fric. of w vuk + ta
Cons. Assim. vut + ta
vutta

(7) ud + y + a + ti
Sampr. Guṇa uad + y + a + ti
Glide Form. wad + y + a + ti
Palatal. waj + y + a + ti
y-Assim. waj + j + a + ti
Fric. of w vaj + j + a + ti
vajjati

This derivation shows that Consonant Assimilation must follow y-Assimilation; otherwise, we will get **vayyati* instead of *vajjati*.

Consonant Assimilation must also follow r-Assimilation, w-Assimilation, and Palatalization of Nasals.

If it is ordered before r-Assimilation:

	sru + nā + ti
n-Retrofl.	sru + ṇā + ti
Cons. Assim.	rru + ṇā + ti
r-Assim.	———
Gem. Red.	ru + ṇā + ti
	**ruṇāti* instead of *suṇāti*

If it is ordered before w-Assimilation:

	sun + ϕ
Sampr. Guṇa	suan
Drop. of Nasal. in Nom.	suā
Glide Form.	swā
Fric. of w	svā
Cons. Assim.	vvā
w-Assim.	—
Gem. Red.	vā
	**vā* instead of *sā*

If it is ordered before Palatalization of Nasals:

	rājn + ā
Cons. Assim.	rānn + ā
Palatal. of Nasal.	———
Vowel Short △	rann + ā
	**rannā* instead of *rañña*

This rule must be ordered after Bartholomea's Law; otherwise:

	labh + twâ
Voice Assim.	laph + twâ
Fric. of w	laph + tvâ
Cons. Assim.	lat + tvâ
Barth. Law	———
Gem. Red.	latvâ
	**latvâ*

The correct derivation:

	labh + twā
Barth. Law	labh + dhwā
Voice Assim.	vacuous
w-Assim.	labh + dhdhā
Gem. Red.	labh + dhā
Cons. Assim.	ladh + dhā
Cons. Deasp. △	lad + dhā
	laddhā

This rule must be ordered after s-Softening; otherwise, *sp* would give *pp*, and *ps* would give *ss*, instead of *pph* and *cch*, respectively. It must also be ordered after h-Assimilation; otherwise, *ph* would give *hh* instead of *pph* It must follow Progressive, Nasal Assimilation to get *sakkoti* from *saknoti*, instead of **sannoti*. It must also follow Syllabification of Resonants; otherwise, we will get **nta*, instead of *gata*, from *gm* + *ta* and **ta* from *kr* + *ta*.

It must be ordered after Readjustment rules, especially after Guṇa and Vṛddhi and Seṭ i Insertion.

Compare the following derivations :

(1)	pitr + am
Vowel Nasal.	pitr + aṃ
Cons. Assim.	pirr + aṃ
Regular Guṇa	pirar + aṃ
	**piraraṃ*

The correct derivation :

	pitr + am
Regular Guṇa	pitar + am
Vowel Nasal.	pitar + aṃ
Cons. Assim.	———
	pitaraṃ

(2)	bhuj + ta
Rever. of Pal.-A	bhug + ta
Voice Assim.	bhuk + ta

Cons. Assim.	bhut + ta
Seṭ i Insert.	bhut + ita
	**bhutita*

The correct derivation :

	bhuj + ta
Seṭ i Insert.	bhuj + ita
Cons. Assim.	———
	bhujita

The prefix *ud*, however, by-passes all the previous rules and undergoes this rule, the *d* always assimilating to the following consonant.

42. *Occlusivization of Geminate Voiced Fricatives* : Geminate *v*'s change to geminate *b*'s.

$$\begin{bmatrix} +\text{obs} \\ -\text{syl} \\ +\text{grv} \\ -\text{high} \\ +\text{vcd} \end{bmatrix}$$
$$1$$

SD : $1 \quad 1$

SC : $1 \qquad\qquad 1$

$$\begin{bmatrix} -\text{cnt} \\ -\text{str} \end{bmatrix} \qquad \begin{bmatrix} -\text{cnt} \\ -\text{str} \end{bmatrix}$$

Examples :

1.	diū	'amuse oneself'	dibbati	(3rd. sg. pass.)
2.	vana	'woods'	nibbana	'without woods'
3.	vahati	'carries'	ubbahati	'carries away'
4.	vinaya	'ethics'	ubbinaya	'outside the code of ethics'

Some derivations :

	(1) diū + y + a + ti
Glide Form.	diw + y + a + ti
y-Assim.	diw + w + a + ti

Fric. of w — div + v + a + ti
Occl. of Vcd. Fric. — dib + b + a + ti
dibbati

(2) nir + wana
Fric. of w — nir + ṿana
Cons. Assim. — niv + vana
Occl. of Vcd. Fric. — nib + bana
nibbana

(3) ud + ujh + a + ti
Sampr. Guṇa — ud + uajh + a + ti
Glide Form. — ud + wajh + a + ti
Weak. of Vcd. Asp. — ud + wah + a + ti
Fric. of w — ud + vah + a + ti
Cons. Assim. — uv + vah + a + ti
Occl. of Vcd. Fric. — ub + bah + a + ti
ubbahati

Occlusivization of Voiced Fricatives must follow y-Assimilation since *y* assimilates to a preceding *w* and results in *ww*. The derived geminate *ww* changes into a geminate *bb*. It must also follow Consonant Assimilation. The consonant *d* of the prefix *ud* assimilates to a following *v*, resulting in *vv*. For example *ud* + *vinaya* ⟶ *uvvinaya*, later *ubbinaya*. If the order is reversed, we would get **uvvinaya*. It must follow r-Assimilation since *ww*, resulting from *wr*, must change to *bb*.

43. *Reduction of Geminate v* : Occasionally, geminate *vv* does not become *bb*. When this happens the geminate is reduced.

$$\begin{bmatrix} +\text{obs} \\ +\text{cnt} \\ +\text{grv} \end{bmatrix}$$
1

SD : 1 1
SC : 1

Examples :

1. viṭṭha 'came' uviṭṭha 'entered' (pple.)
2. eti 'goes' udeti 'goes out' (3rd. sg. pres.)

Derivation :

	ud + wis + ta
s-Retrofl.	ud + wiṣ + ta
Retrofl. Assim.	ud + wiṣ + ṭa
s-Soften.	ud + wih + ṭa
Metathesis	ud + wiṭ + ha
Fric. of w	ud + viṭ + ha
h-Assim.	ud + viṭ + ṭha
Cons. Assim.	uv + viṭ + ṭha
Occl. of Vcd. Fric.	——— exception
Red. of Gem. v	u + viṭ + ṭha
	uviṭṭha

The second example indicates the underlying prefix to be *ud* and not *u*.

44. *Burma Occlusivization* : After *v*, y-Assimilation generally does not take place, especially if *vy* is the prefix *vi*. In this situation, the usual result is surface *vy*. But in Burma dialect, fricative plus glide was inadmissible, whereas stop plus glide was permitted. *v*, before *y*, converted to *b* to fit the Burmese system.

$$\begin{bmatrix} +\text{obs} \\ +\text{grv} \end{bmatrix} \longrightarrow \begin{bmatrix} -\text{cnt} \\ -\text{str} \end{bmatrix} / \text{——} \begin{bmatrix} -\text{cns} \\ -\text{syl} \end{bmatrix}$$

Examples:

1. byābādha 'evil' bādha 'oppression'
2. vipatha 'wrong path' patha 'path'

Derivation:

	vi + ā + bādha
Glide Form.	vy + ā + bādha
y-Assim.	—— exception
Burm. Occl.	by + ā + bādha
	byābādha

The second example justifies positing *vi* as a prefix in the first example.

45. *Reduction of Geminate h*: Geminate *h* is reduced

$$\begin{bmatrix} -\text{cns} \\ -\text{syl} \\ -\text{high} \end{bmatrix}_1 \quad \begin{bmatrix} -\text{cns} \\ -\text{syl} \\ -\text{high} \end{bmatrix}_2 \Longrightarrow 1$$

Examples:

1. hasati 'laughs' uhasati 'laughs out'
2. eti 'goes' udeti 'goes out'

The second example gives a clue as to the underlying presentation of the prefix.

3. karoti 'does' kassati (3rd. sg. fut.)
   kāhati (3rd. sg. fut.)

Derivation:

	ud + has + a + ti
Cons. Assim.	uh + has + a + ti
Red. of Gem. h	u + has + a + ti
	uhasati

This rule must follow Consonant Assimilation. The prefix *ud* is an exception to h-Assimilation as it is to all other forms of progressive assimilation. Instead, the *d* of *ud* undergoes Consonant Assimilation. If the consonant, to which it assimilates, is *h*, the resultant geminate *hh* must be reduced.

46. *Nasal Assimilation* : A nasal consonant, when followed by another consonant, assimilates to it in place of articulation.

$$\begin{bmatrix} +\text{cns} \\ +\text{nas} \end{bmatrix} \longrightarrow \begin{bmatrix} \alpha\ \text{high} \\ \beta\ \text{grv} \\ \gamma\text{flt} \end{bmatrix} \quad \text{——} \quad \begin{bmatrix} +\text{cns} \\ -\text{syl} \\ \alpha\ \text{high} \\ \beta\ \text{grv} \\ \gamma\text{flt} \end{bmatrix}$$

Examples:

1. sam—nah 'tie' (root) sannaddha (pple.)
2. ṭhāti 'stands' saṇṭhāti

3. pamodita 'delighted' sampamodita
4. buddha 'enlightened' sambuddha
5. dhamati 'blows' sandhamati
6. dhūpeti 'fumigates' sandhūpeti
7. nidhāna 'putting down' sannidhāna
8. dam 'tame' (root) danta (pple.)

Some derivations:

(1) sam + najh + ta
Rever. of Pal.—A sam + nagh + ta
Barth. Law sam + nagh + dha
Cons. Assim. sam + nadh + dha
Nasal Assim. san + nadh + dha

(2) sam + ṭṭhi + a + ti
Gem. Red. sam + ṭhi + a + ti
Regular Guṇa sam + ṭhai + a + ti
Laryng. Coales. sam + ṭhā + a + ti
Like Vow. Coales. sam + ṭhā + ti
Nasal Assim. saṇ + ṭhā + ti
saṇṭhāti

(3) dam + ta
Nasal Assim. dan + ta
danta

(4) sam + buddha
Nasal Assim. vacuous application
sambuddha

This rule must be ordered after all rules which have a potential of changing consonants which follow nasals. Rules of this type are Palatalization, Consonant Assimilation, and Occlusivization of Geminate Voiced Fricatives; for example:

npt > ntt > nt and not *mt

ndy > njj > ñj and not *nj

nwr > mbb > mb and not labio-dental nasal + b

47. *Gemination of Palatal Aspirates*:

$$V \quad \begin{bmatrix} +\text{obs} \\ +\text{str} \\ -\text{cnt} \\ +\text{H.S.P.} \end{bmatrix} \quad V$$

$$1 \qquad 2 \qquad\qquad 3 \Longrightarrow 1 \quad 2 + 2\ 3$$

Examples:

1. chindati 'cuts off' acchindi (3rd. sg. aor.)
2. chādeti 'covers' acchādeti 'clothes'

Derivations:

(1) a + chind + i

Gem. of Pal. Asp. a + chchind + i

(2) ā + chād + aya + ti

Coales. of Gl. with Vowels ā + chād + e + ti

Gem. of Pal. Asp. ā + chchād + e + ti

This rule also applies redundantly to *jh*. Since the source of *jh* is *dhy*, it is always a geminate intervocalically. Aspirated affricates are very complex segments divisible into three discrete parts; a stop, a fricative, and a puff of air. A segment of such complexity is almost impossible to pronounce short.

48. *Consonant Deaspiration*: An aspirated consonant becomes unaspirated before a consonant.

$$C \longrightarrow [-\text{H.S.P.}] \;/\; \underline{\quad} \; C$$

Examples:

1. labhati 'obtains' laddhā (grd.)
   lacchati (3rd. sg. fut.)
2. budh 'be awake' bujjhati (3rd. sg. pres.)
3. adhibhāsati 'speaks' ajjhabhāsi (3rd. sg. aor.)
4. dharati 'holds' uddharati 'removes'

Some derivations:

Barth. Law (1) labh + ta

labh + dah

Cons. Assim.	labh + dha
Cons. Deasp.	lad + dha
	laddha

(2) labh + twā

Barth. Law	labh + dhwā
w-Assim.	labh + dhdhā
Gem. Red.	labh + dhā
Cons. Assim.	ladh + dhā
Cons. Deasp.	lad + dhā
	laddhā

(3) budh + y + a + ti

Palatal.	bujh + y + a + ti
y-Assim.	bujh + jh + a + ti
Cons. Deasp.	buj + jh + a + ti
	bujjhati

(4) adhi + a + bhās + i

Glide Form.	adhy + a + bhās + i
Palatal.	ajhy + a + bhās + i
y-Assim.	ajhjh + a + bhās + i
Cons. Deasp.	ajjh + a + bhās + i
	ajjhabhāsi

(5) ud + dhar + a + ti

Cons. Assim.	udh + dhar + a + ti
Cons. Deasp.	ud + dhar + a + ti
	uddharati

This rule must follow Consonant Assimilation; otherwise, we would get **udhdharati*, instead of *uddharati*, from *ud* + *dharati*. This rule has to follow y-Assimilation since a derived consonant becomes the environment for the application of this rule. See the following derivation:

	budh + y + a + ti
Palatal.	bujh + y + a + ti

Cons. Deasp.	———
y-Assim.	bujh + jh + a + ti
	**bujhjhati*

The correct derivation:

	budh + y + a + ti
Palatal.	bujh + y + a + ti
y-Assim.	bujh + jh + a + ti
Cons. Deasp.	buj + jh + a + ti
	bujjhati

r-Assimilation must precede Consonant Deaspiration; otherwise, a sequence such as *bhr* will change into **bb* rather than *bbh*. It must follow w-Assimilation; otherwise, *w* will assimilate to an unaspirated consonant resulting in a nonaspirate geminate; for example:

	labh + twā
Barth. Law	labh + dhwā
Cons. Assim.	ladh + dhwā
Gem. Red.	ladh + wā
Cons. Deasp.	lad + wā
w-Assim.	lad + dā
	**laddā*

The correct derivation :

	labh + twā
Barth. Law	labh + dhwā
w-Assim.	labh + dhdhā
Gem. Red.	labh + dhā
Cons. Assim.	ladh + dhā
Cons. Deasp.	lad + dhā
	laddhā

This rule must also follow Bartholomea's Law since the aspirated voiced consonant causes the following dental *t* to become *dh*. If the order is reversed, voiced aspirates will lose their aspiration due to a following dental obstruent, and, then Bartholomea's Law will not apply.

It has to follow the Guṇa and Vṛddhi rule; otherwise, an aspirated consonant will lose its aspiration before a resonant ; for example, *bhr* will result in *bar* rather than *bhar*. It should follow Gemination of Palatal Aspirates to arrive at *cch* from *chch*, which is the result of the latter.

49. *Vowel Shortening Before Two or More Consonants* : A long vowel becomes short when followed by more than one consonant.

$$V \longrightarrow \left[-\text{lng} \right] \; / \; \text{——} \; CC$$

Examples :

1. īp 'desire to attain' icchati 3rd. sg. des.)
2. bhū 'be' bhossati (3rd. sg. fut.)
3. chādeti 'covers' acchādeti 'clothes'
4. sūyati/suyyati 'is heard' (3rd. sg. pass.)

Some derivations :

(1) īp + s + a + ti

Redupl.	ī + īp + s + a + ti
Like Vow. Coales.	īp + s + a + ti
Assim. of Fr. Cons.	$īt^{s}$ + s + a + ti
s-Soften.	$īt^{s}$ + h + a + ti
Pal. of Affr.	īc + h + a + ti
h-Assim.	īc + ch + a + ti
Vow. Short. Bef. Cons.	ic + ch + a + ti
	icchati

(2) bhū + sy + a + ti

Regular Guṇa	bhaū + sy + a + ti
Mid Vow. Form.	bho + sy + a + ti
y-Assim.	bho + ss + a + ti
Vow. Short. Bef. Cons.	bhŏ + ss + a + ti
	bhŏssati

(3) sās + ta 'taught'

	sāh + ta
s-Soften.	sāt + ha
Metathesis	

h-Assim. sāt + tha
Vow. Short. Bef. Cons. sat + tha
sattha

(4) bhuj + sy + a + ti
Regular Guṇa bhauj + sy + a + ti
Rever. of Pal. bhaug + sy + a + ti
Mid. Vow. Form. bhog + sy + a + ti
Voice Assim. bhok + sy + a + ti
s-Soften. bhok + hy + a + ti
Metathesis bhok + yh + a + ti
y-Assim. bhok + kh + a + ti
Vow. Short. Bef. Cons. bhŏk + kh + a + ti
bhŏkkhati

(5) rājn + ā
Prog. Nas. Assim. rājñ + ā
Cons. Assim. rāññ + ā
Vow. Short. Bef. Cons. raññ + ā
raññā

(6) sru + y + a + ti
Vow. Length. in Pass. srū + y + a + ti
y-Gem. srū + yy + a + ti
r-Assim. ssū + yy + a + ti
Gem. Red. sū + yy + a + ti
Vow. Short. Bef. Cons. su + yy + a + ti
suyyati

(7) ā + chād + aya + ti
Coales. of Gl. with Vowels ā + chād + e + ti
Gem. of Palatal Asp. ā + chchād + e + ti
Cons. Deasp. ā + cchād + e + ti
Vow. Short. Bef. Cons. a + cchād + e + ti
acchādeti

(8) chid + sy + a + ti
Regular Guṇa chaid + sy + a + ti
Mid Vow. Form. ched + sy + a + ti
Assim. of Fr. Cons. ched^{z}+sy+a+ti

Voice Assim.	chet^{s} + sy + a + ti
s-Soften.	chet^{s} + hy + a + ti
Metathesis	chet^{s} + yh + a + ti
y-Assim.	chet^{s} + t^{s}h + a + ti
Palatal. of Affr.	chec + ch + a + ti
Vow. Short. Bef. Cons.	chĕc + ch + a + ti
	chĕcchati

(9)	bhid + sy + a + ti
Regular Guṇa	bhaid + sy + a + ti
Mid. Vow. Form.	bhed + sy + a + ti
Assim. of Fr. Cons.	bhed^{z} + sy + a + ti
Voice Assim.	bhet^{s} + sy + a + ti
s-Soften.	bhet^{s} + hy + a + ti
Metathesis	bhet^{s} + yh + a + ti
y-Assim.	bhet^{s} + t^{s}h + a + ti
Palatal. of Affr.	bhec + ch + a + ti
Vow. Short. Bef. Cons.	bhĕc + ch + a + ti
	bhĕcchati

(10)	nī + sy + a + ti
Regular Guna	naī + sy + a + ti
s-Retrofl.	naī + ṣy + a + ti
Mid. Vow. Form.	ne + ṣy + a + ti
y-Assim.	ne + ṣṣ + a ti
Vow. Short. Bef. Cons.	nĕ + ṣṣ + a + ti

(11)	di + sy + a + ti
Regular Guṇa	dai + sy + a + ti
Laryng. Coales.	dā + sy + a + ti
y-Assim.	dā + ss + a + ti
Vow. Short. Bef. Cons.	da + ss + a + ti
	dassati

(12)	bhās + y + a + ti
y-Assim.	bhās + s + a + ti
Vow. Short. Bef. Cons.	bhas + s + a + ti
	bhassati

(13) hū + isy + a + ti

Regular Guṇa — haū + isy + a + ti
s-Retrofl. — haū + iṣy + a + ti
Glide Form. — haw + iṣy + a + ti
Drop of Inter. w — ha + iṣy + a + ti
Mid Vow. Form. — he + ṣy + a + ti
y-Assim. — he + ṣṣ + a + ti
Vow. Short. Bef. Cons. — hĕ + ṣṣ + a + ti

(14) wiś + sy + a + ti

Regular Guṇa — waiś + sy + a + ti
Rever. of Pal.-A — waik + sy + a + ti
Mid Vow. Form. — wek + sy + a + ti
s-Soften. — wek + hy + a + ti
Metathesis — wek + yh + a + ti
y-Assim. — wek + kh + a + ti
Fric. of w — vek + kh + a + ti
Vow. Short. Bef. Cons. — vĕk + kh + a + ti
vĕkkhati

(15) kam + a + ti
(3rd. sg. inten.)

Redupl. (a) — cām + kam + a + ti
Nasal Assim. — cāṅ + kam + a + ti
Vow. Short. Bef. Cons. — caṅ + kam + a + ti
caṅkamati

This rule must follow Gemination of Palatal Affricate. No long vowel is found before intervocalic *cch*. It must also follow Guṇa and Vṛddhi, Like Vowel Coalescence, and Mid Vowel Formation because these rules produce long vowels.

50. *Deretroflexion and Depalatalization of s* : *s* is the only Pāli sibilant.

$$\begin{bmatrix} +\text{obs} \\ +\text{str} \\ +\text{cnt} \end{bmatrix} \longrightarrow \begin{bmatrix} -\text{flt} \\ -\text{high} \end{bmatrix}$$

Examples :

1.	bhu	'be'	bhossati	(3rd. sg. fut.)
2.	ni	'lead'	nessati	(3rd. sg. fut.)
3.	wis	'enter'	vekkhati	(3rd. sg. fut.)

Some derivations :

(1) bhū + sy + a + ti

Regular Guṇa — bhaū + sy + a + ti
s-Retrofl. — bhaū + ṣy + a + ti
Mid Vow. Form. — bho + ṣy + a + ti
y-Assim. — bho + ṣṣ + a + ti
Vow. Short. Bef. Cons. — bhŏ + ṣṣ + a + ti
Deretrofl. of s — bhŏ + ss + a + ti

bhŏssati

(2) nī + sy + a + ti

Regular Guṇa — naī + sy + a + ti
s-Retrofl. — naī + ṣy + a + ti
Mid Vow. Form. — ne + ṣy + a + ti
y-Assim. — ne + ṣṣ + a + ti
Vow. Short. Bef. Cons. — nĕ + ṣṣ + a + ti
Deretrofl. of s — nĕ + ss + a+ti

nĕssati

(3) hū + isy + a + ti

Regular Guṇa — haū + isy + a + ti
s-Retrofl. — haū + iṣy + a + ti
Glide Form. — haw + iṣy + a + ti
Drop of Inter. w — ha + iṣy + a + ti
Mid Vow. Form. — he + ṣy + a + ti
y-Assim. — he + ṣṣ + a + ti
Vow. Short. Bef. Cons. — hĕ + ṣṣ + a + ti
Deretrofl. of s — hĕ + ss + a + ti

hĕssati

(4) wiś + a + ti

Fric. of w — viś + a + ti
Depalatal. of s — vis + a + ti

visati

The necessity of this rule is obvious for several reasons. Pāli has s-Retroflexion rule which changes alveolar sibilants to retroflexes after *r*, *i*, and *u*. Newly derived *s*'s change dental obstruents to retroflexes thus providing an input for Retroflex

Assimilation. Dental obstruents become retroflex after retroflex stops as well as retroflex *ṣ*. Some underlying dental sibilants behave like palatals in that they revert to velars or retroflexes. The rule Reversion of Palatals to Velars and Retroflexes is motivated on other grounds, namely, that *c*, *ch*, and *j* revert to velars and retroflexes. Therefore, some underlying *ś*'s are needed. These palatals are realized as alveolar sibilants before vowels. To account for the nonappearance of *ś*'s before vowels, Pāli has to have the above rule.

CHAPTER III

HISTORICAL PROCESSES IN PĀLI

Some sound changes seem to be synchronic rules but are also historical processes or diachronic sound changes. Some of these sound changes have caused restructuring in Pāli. This chapter deals with such sound changes. It also deals with the synchronic order of Pāli rules in relation with their original order.

The Chronology of Sound Changes and the Order of Synchronic Rules

Pāli has kept most of the Skt. phonological rules. It also has a number of Phonological rules of its own. Usually, the rules of Pāli that are not found in Skt. are either strictly ordered after or unordered with respect to the Skt. rules. Also, the rules which Pāli and Skt. share are usually found in the same order in the two languages. Occasionally, however, it seems that two Skt. rules have been orderd or that a Pāli rule has been inserted ahead of a Skt. rule. In this section, I will discuss the most important examples of these changes.

1. *Mid Vowel Formation and Low Vowel Shortening*

Saṃskrit Mid Vowel Formation was slightly different from Pāli Mid Vowel Formation. It was not as general as Pāli Mid Vowel Formation. Skt. did not coalesce a low long vowel, (ā), with high vowels into mid vowels before a consonant. Rather, *ā* was shortened before high vowels. *ā*+*i* and *ā*+*u* changed into *ai* and *au* before a consonant.

Pāli changed all sequences of *ā*+*i*, as well as *a*+*i* into *e* and *ā*+*u*, or *a*+*u*, into *o*. It seems that Pāli has generalized the Mid Vowel Formation rule.

Skt. $\begin{bmatrix} -\text{cns} \\ +\text{syl} \\ +\text{low} \\ -\text{lng} \end{bmatrix}$ $\begin{bmatrix} -\text{cns} \\ +\text{high} \\ -\text{low} \end{bmatrix}$ $\begin{Bmatrix} \text{C} \\ \# \end{Bmatrix}$

1 2 3 $\Longrightarrow$ 2 3

$\begin{bmatrix} -\text{high} \\ +\text{lng} \end{bmatrix}$

Pāli $\begin{bmatrix} -\text{cns} \\ +\text{syl} \\ +\text{low} \end{bmatrix}$ $\begin{bmatrix} -\text{cns} \\ +\text{high} \\ -\text{low} \end{bmatrix}$ $\begin{Bmatrix} \text{C} \\ \# \end{Bmatrix}$

1 2 3 $\Longrightarrow$ 2 3

$\begin{bmatrix} -\text{high} \\ +\text{lng} \end{bmatrix}$

The Skt. rule contains 11 features, while the Pāli rule contains 10 features. The feature [lng] has been dropped in the Pāli rule.

Some examples :

Skt. dyotate 'shines' (3rd. sg. pres.)

	diut + a + te
Regular Guṇa	diaut + a + te
Glide Form.	dyaut + a + te
Mid Vow. Form.	dyot + a + te
	dyotate

Pāli jotati 'shines' (3rd. sg. pres.)

	diut + a + ti
Regular Guṇa	diaut + a + ti
Glide Form.	dyaut + a + ti
Mid Vow. Form.	dyot + a + ti
Palatal.	jyot + a + ti
y-Assim.	jjot + a + ti
Gem. Red.	jot + a +ti
	jotati

But : Skt. go 'cow'

nom. sg.	nom. pl.	inst. pl.
gau + s	gau + as	gau + bish

Guṇa	gaau + s	gaau + as	———
Like Vow. Coales.	gāu + s	gāu + as	———
Glide Form.	———	gāw + as	———
Mid Vow. Form.	———	———	go + bhis
Low Vow. Short.	*gaus*	*gāvas*	*gobhis*

	Pali go 'cow'		
	nom. sg.	nom. pl.	inst. pl.
	gau + s	gau + o	gau + hi
Regular Guṇa	gaau + s	gaau + o	———
Like Vow. Coales.	gāu + s	gāu + o	———
Glide Form.	———	gāw + o	———
Mid Vow. Form.	go + s	———	go + hi
Drop. of Final Cons.	go	———	———
	go	*gāvo*	*gohi*

*Skt. final—*as* > *-o* in Pāli

Another way of looking at the Pāli Mid Vowel Formation rule is through the principle of maximization of feeding order. Skt. had two rules, Mid Vowel Formation and Low Vowel Shortening, in that order. If the order is reversed, the Pāli surface forms will result. A reverse in the order of these rules would allow the second rule to serve as the input to the first. According to Kiparsky (1968 (a), p. 200) "rules tend to shift into the order which allow their fullest utilization in the grammar." The order of these rules in Skt. and Pāli is as follows :

Skt.	(1) Mid Vowel Formation (2) Low Vowel Shortening
Pāli	(1) Low Vowel Shortening (2) Mid Vowel Formation

Consider the following examples of Skt. where Mid Vowel Formation does not apply but low Vowel Shortening does :

(1) su + kr̥ta	saukr̥tya
(2) pr̥thi	pārthiva
(3) sam + rāj	sāmrājya

(4) carama + śīrṣa		carama śairṣika
(5) jīva + loka		jīva laukika

The forms in the second column are secondary derivatives. Vr̥ddhi (ā-insertion) occurs in secondary derivatives, which are formed by the addition of a suffix to a form which already contained a suffix.

Some derivations :

(1) carama + śīr + si + ka (cp. śir+ as)

Vr̥ddhi	carama + śāīr + si + ka
s-Retrofl.	carama + śāīr + ṣi + ka
High Vow. Short. (/V—C)	carama + śāir + ṣi + ka
Mid Vow. Form.	———
Low Vow. Short.	carama + śair + ṣi + ka
	carama śairṣika

(2) su + kr + t + ya

Vr̥ddhi	sāu + kr + t + ya
Syl. of Res.	sāu + kr̥ + t + ya
Mid Vow. Form.	———
Low Vow. Short	sau + kr̥ + t + ya
	saukṛtya

(3) prth + i + va

Vr̥ddhi	pārth + i + va
Mid Vow. Form.	———
Low Vow. Short.	———
	pārthiva

Note that Low Vowel Shortening does not apply before *r*.

(4) jīva + luk + a jīva + luk + i + ka

Guṇa & Vr̥ddhi	jīva + lauk + a	jīva + lāuk + i + ka
Mid Vow. Form.	jīva + lok + a	———
Low Vow. Short.	———	jīva + lauk + i + ka
	jiva loka	*jiva laukika*

The above derivations show that Skt. has a Low Vowel Shortening rule which shortens *ā* before high vowels. This rule

is ordered after Mid Vowel Formation. If the order were reversed, we would get wrong forms such as **carama śerṣaka* instead of *carama śairṣika* **sokr̥tya* instead of *saukr̥tya*, and **gos* (nom. sg.) instead of *gaus*. But, reversing the order yields the correct forms in Pāli. For example :

	nom. sg.	inst. pl.
	gau + s	gau + hi
Regular Guṇa	gaau + s	———
Like Vow. Coales.	gāu + s	———
Mid Vow. Form.	go + s	go + hi
Drop. of Final Cons.	go	———
	go	*gohi*

Compare Pāli *go* (nom. sg.) with Skt. *gaus* (nom. sg.). See the derivation of *gau*, 'cow', in Skt.

If the order had been reversed, the two rules would have been in what Kiparsky calls "feeding order." The output of the first rule would have been input to the second. Whenever two rules are in feeding order and both of them apply in the same environment, they are automatically collapsed since there is no need to keep them separate. Consider the following :

(1) $a \longrightarrow b / \underline{\quad} X$

(2) $b \longrightarrow c / \underline{\quad} X$

Rule (1) feeds rule (2). Since both of them have the same environment, they can be collapsed as follows :

$$\left\{ \begin{matrix} a \\ b \end{matrix} \right\} \longrightarrow C / \underline{\quad\quad} X$$

If reordering had occurred in Pāli, collapsing would have automatically taken place :

Low Vow. Short. $\begin{bmatrix} āu \\ āi \end{bmatrix} \longrightarrow \begin{bmatrix} au \\ ai \end{bmatrix} / \underline{\quad\quad} C$

Mid Vow. Form. $\begin{bmatrix} au \\ ai \end{bmatrix} \longrightarrow \begin{bmatrix} o \\ e \end{bmatrix} / \underline{\quad\quad} C$

These rules can be collapsed as follows :

$$\begin{bmatrix} \left\{ \begin{matrix} \bar{a}i \\ ai \end{matrix} \right\}_1 \\ \\ \left\{ \begin{matrix} \bar{a}u \\ au \end{matrix} \right\}_2 \end{bmatrix} \longrightarrow \begin{bmatrix} \{ e \}_1 \\ \\ \{ o \}_2 \end{bmatrix} / \underline{\quad\quad} C$$

There is another possibility concerning Mid Vowel Formation. Pāli may have added a new Mid Vowel Formation rule to its grammar, ordered after the Skt. Mid Vowel Formation rule and the Low Vowel Shortening rule. The addition of this rule would produce the correct Pāli forms. Consider the following examples :

	rujh+a+ti	gau+s (nom. sg.)
Regular Guṇa	raujh+a+ti	gaau+s
Like Vow. Coales.	———	gāu+s
Weaken. of Vcd. Asp.	rauh+a+ti	——
Mid Vow. Form.	roh+a+ti	——
Low Vow. Short.	———	gau+s
Mid Vow. Form.	———	go+s
Drop. of Final Cons.	———	go
	rohati	*go*

The newly added Mid Vowel Formation rule would be capable of handling not only all the newly created Mid Vowels, but also those produced by the old Mid Vowel Formation rule. Consequently, the old rule would have been immediately dropped from the grammar.

	rujh+a+ti	gau+s
Regular Guṇa	raujh+a+ti	gaau+s
Like Vow. Coales.	———	gāu+s
Low Vow. Short.	———	gau+s
Weak. of Vcd. Asp.	rauh+a+ti	——
Mid Vow. Form.	roh+a+ti	go+s
Drop. of Final Cons.	———	go
	rohati	*go*

After this step, the Low Vowel Shortening rule would be dropped, and the new Mid Vowel Formation rule generalized as explained earlier.

This last alternative is considered the least attractive by Kiparsky (1968) and King (1969).

2. *Mid Vowel Formation and the Drop of Intervocalic w*

In Pāli, intervocalic w is occasionally dropped, and low and high vowels merge to form mid vowels. The synchronic order of this rule and Mid Vowel Formation is:

(1) The Drop of Intervocalic w
(2) Mid Vowel Formation

The Drop of Intervocalic w is a Pāli rule, while Mid Vowel Formation is a Skt. rule. The following derivation demonstrates the synchronic order of these rules in Pāli.

	hũ+isy+a+ti (3rd. sg. fut.)
Regular Guṇa	hau+isy+a+ti
s-Retrofl.	hau+iṣy+a+ti
Glide Form.	haw+iṣy+a+ti
Drop of Inter. w	ha+iṣy+a+ti
Mid Vow. Form.	he+ṣy+a+ti
y-Assim.	he+ṣṣ+a+ti
Deretrofl. of s	he+ss+a+ti
	hessati

If the order of the Drop of Intervocalic w and Glide Formation is reversed, we get the wrong form. See the following derivation:

	hū+isy+a+ti
Regular Guṇa	hau+isy+a+ti
s-Retrofl.	hau+iṣy+a+ti
Glide Form.	haw+iṣy+a+ti
Mid Vow. Form.	———
Drop of Inter. w	ha+iṣy+a+ti
y-Assim.	ha+iṣṣ+a+ti
Deretrofl. of s	ha+iss+a+ti
	**haissati*

Skt. has the following derivation:

	bhū+isy+a+ti
Regular Guṇa	bhaū+isy+a+ti
s-Retrofl.	bhaū+iṣy+a+ti
Glide Form.	bhaw+iṣy+a+ti
Mid. Vow. Form.	— — —
	bhaviṣyati

The following is another example which indicates the strict ordering between Glide Formation and the Drop of Intervocalic w in Pāli.

	a+hū+is+um (1st. pl. aor.)
Regular Guṇa	a+haū+is+um
s-Retrofl.	a+haū+iṣ+um
Glide Form.	a+haw+iṣ+um
Drop of Inter. w	a+ha+iṣ+um
Mid Vow. Form.	a+he+ṣ+um
Vow. Nas.	a+he+ṣ+uṃ
Deretrofl. of s	a+he+s+uṃ
	ahesuṃ

The above derivations clearly indicate that Glide Formation must be ordered before Mid Vowel Formation in Pāli. Both Glide Formation and Mid Vowel Formation are Skt. rules. This fact means that Pāli may have inserted the Drop of Intervocalic w between Glide Formation and Mid Vowel Formation. Recall, however, that Mid Vowel Formation is different in the two languages, being more general in Pāli. I proposed three possible explanations for this difference: generalization, reordering, and addition of a new rule which was exactly the same as the old rule. Only the last possibility adequately accounts for the difference in applicability of the Skt. and Pāli Mid Vowel Formation rules and for the ordering of the Drop of Intervocalic w. If the Mid Vowel Formation rule in Pāli is viewed as an entirely new process, it would be quite reasonable to claim that it occurred chronologically after the Drop of Intervocalic w. The historical derivation of *ahesuṃ* would be as follows:

	a+hū+is+um
Regular Guṇa	a+haū+is+um
s-Retrofl.	a+haū+iṣ+um
Glide Form.	a+haw+iṣ+um
Mid Vow. Form.	———
Low Vow. Short.	———
Drop of Inter. w	a+ha+iṣ+um
Mid Vow. Form.	a+he+ṣ+um
Vow. Nas.	a+he+ṣ+uṃ
Deretrofl. of s	a+he+s+uṃ
	ahesuṃ

The examples given so far give no support either to non-chronological rule insertion or to rule reordering. In fact, they support the view that phonological processes affect surface forms and that, if they are reflected in synchronic rules, these rules will appear at the end of the grammar.

3. *Shortening of Nasalized Vowels*

Pāli has a rule which shortens nasalized vowels. This rule is very unnatural. Most languages either leave the quantity of nasalized vowels unaltered or lengthen short nasalized vowels if they contain a Vowel Nasalization rule. An example of the first phenomenon is found in Skt. Skt. *kaṃsa* 'vessel made of metal' < *kansa* and *kāṃsya* 'brass' < *kānsya*. An example of the second phenomenon is Hindi *pā̃c* from Skt. *pañca*.

Pāli has two rules, Nasalization of Vowels and Shortening of Nasalized Vowels. Their synchronic order is demonstrated by the following derivations:

	(1) kanyā+m (acc. sg).	(2) pānsu 'dust'
Vow. Nas.	kanyā+ṃ	pāṃsu
Palatal.	kañyā+ṃ	———
y-Assim.	kañña+ṃ	———
Short. of Nas. Vow.	kañña+ṃ	paṃsu
	*kañña*ṃ	*paṃsu*

	(3) kansa 'vessel made of metal'
Vow. Nas.	kaṃsa
Short. of Nas. Vow.	vacuous
	kaṃsa

	(4) kānsa 'bronze'
Vow. Nas.	kāṃsa
Short. of Nas. Vow.	*kaṃsa*

Pāli has another Vowel Shortening rule which shortens vowels before two consonants. The presence of two Vowel Shortening rules is suspect. What seems to have happened is that Pāli had one rule which shortened vowels before two consonants or a consonant followed by a word boundary. It can be stated in the following way.

$$V \longrightarrow [-\text{lng}] \;/\; \text{——} \; C \begin{Bmatrix} C \\ \# \end{Bmatrix}$$

This rule has to precede the Vowel Nasalization rule. The nasal consonant still has to be present along with another consonant to shorten the vowel. If Vowel Nasalization were to precede Vowel Shortening, the nasal consonant would be dropped when the vowel is nasalized; and, when the nasal consonant is dropped, there would remain only one consonant after the vowel. Thus, the structural description for Shortening of Nasalized Vowels would not be met. Hence, nasalized long vowels would remain. For example:

	kānsa 'bronze'	pānsu 'dust'
Vow. Nas.	kāṃsa	pāṃsu
Vow. Short	——	——
	**kāṃsa*	**pāṃsu*
	(kã̄sa)	(pã̄su)

Thus, the order of the rules must be the following:

(1) $V \longrightarrow [-\text{lng}] \;/\; \text{——} \; C \begin{Bmatrix} C \\ \# \end{Bmatrix}$

(2) $V \quad N \quad \begin{Bmatrix} S \\ \# \end{Bmatrix}$

$1 \quad 2 \quad 3 \Longrightarrow 1 \quad 3$

$[+\text{nas}]$

The Vowel Shortening rule is strictly a Pāli rule, but Vowel Nasalization is both a Skt. and a Pāli rule. Vowel

Nasalization is a low level phonetic rule. Pāli added the Vowel Shortening rule before Vowel Nasalization. This situation is much different from the situation with regard to the Drop of Intervocalic w and Mid Vowel Formation. We cannot handle the data here by proposing the addition of a new Nasalization rule after the Vowel Shortening rule had been added:

	kanyā+m	mānsa
V N S 1 2 3 ⟹ 1 3 [+nas]	———	māṃsa
(Skt. rule)		mãsa

$$V \longrightarrow [-\text{lng}] \Big/ \text{——} C \begin{Bmatrix} C \\ \# \end{Bmatrix}$$

	kanya+m	———
(Pāli rule)		

$$V \quad N \begin{Bmatrix} S \\ \# \end{Bmatrix}$$

1 2 3 ⟹ 1 3 [+nas]	kanya+ṃ	———
(new Nasalization Rule)		
Palatal.	kañya+ṃ	———
y-Assim.	kañña+ṃ	———
	*kañña*ṃ	**māṃsa*
	(kañña̰)	(mãsa)

The vowel shortening rule must apply to Saṃskrit underlying forms.

There is a significant difference between Mid Vowel Formation, the rule that the Drop of Intervocalic w seemed to have been inserted before, and Vowel Nasalization, the rule that Vowel Shortening was inserted before. Mid Vowel Formation is a major phonological rule. On the other hand, the Pāli Vowel Nasalization rule is a low level phonetic rule. There are no contrasts in Pāli between nasalized vowels and vowel plus nasal sequences. (This is not to claim that Vowel Nasalization is always a low level phonetic rule. It can become

a major phonological rule by having another rule ordered after it. For example, in French, Vowel Nasalization precedes a rule dropping final *ə*:

	VN	VN ə
Vowel Nas.	$\tilde{V}$	——
ə-Drop	——	VN
	$\tilde{V}$	*VN*

Contrast between final nasalized vowels and final vowel plus nasal sequences result.)

I propose the following principle. Phonological rules may be added to grammar in two places: (1) at the end of the phonological component; and (2) before a low level phonetic rule. Rules may not be inserted before major phonological rules.

Sound Changes Resulting in Restructuring

Almost all of the changes between Skt. and Pāli are reflected in phonological rules. Occasionally, however, sound changes resulted in restructuring and left no traces in the grammar. The assimilation of an *l* to a preceding obstruent is an example of this.

(1) Skt. plavati > Pāli pavati 'rushes'
(2) Skt. śukla > Pāli sukka 'white'
(3) Skt. śleṣman > Pāli semha 'mucus phlegm'

This historical process gave rise to restructuring. There are no examples of *l* alternating with obstruents, and, therefore, there is no need of a synchronic *l* assimilation rule.

Alternations are not possible due to several reasons. The progressive assimilation processes precede the regressive assimilation processes. The assimilation of *l* to a preceding obstruent is one of the progressive processes while General Consonant Assimilation is regressive. Alternations are not found because all prefixes ended with vowels in an older stage of the language. *ud* is a prefix in Pāli, but, in Vedic, it was a separate word. The progressive assimilation processes took place before *ud* became a prefix. Therefore, if the root began with *l*, the *l* did not assimilate to *d*. Later, *ud* became a prefix and underwent

the (regressive) Consonant Assimilation rule. The other reason for l-Assimilation not producing alternations is that no suffix begins with *l*.

Another historical process which gave rise to restructuring is the insertion of a voiced stop between a nasal and a liquid. The inserted stop was homorganic with the nasal consonant. Examples are the following :

(1) Skt. āmra > Pāli amba 'mango'

(2) Skt. āmla >Pāli amba 'sour'

(3) Skt. gulma > gumla > Pāli gumba 'bush'

After the historical process of inserting homorganic stops took place, *l* assimilated to that stop, as explained earlier.

(1) āmra > āmbra > āmbba > āmba > amba (by Vowel Shortening)

(2) gulma > gumla (by Metathesis) > gumbla > gumbba > gumba

The underlying forms of these words in Pāli cannot contain liquids because they are single morphemes. They were restructured. Alternations are not found since all the prefixes in the older language ended with vowels. *sam* is a Pāli prefix, but it was an independent word in Vedic and underwent external Sandhi rules. The *m* of *sam* dropped after nasalizing the preceding vowel before an *r* and became a nasalized $\tilde{l}$ before *l*. When *sam* became a prefix in Pāli, it was handled by special prefix rules. Also, Pāli has no suffixes beginning with liquids.

Sound Changes Not Resulting in Restructuring

Pāli has only one sibilant, alveolar *s*, in surface forms of its morphemes. The nonappearance of palatal and retroflex sibilants makes us think that these must have been restructured as *s*'s in Pāli. But there are good reasons to posit *ś* and *ṣ* in Pāli derivations. In roots ending in *s* in Pāli, the final *s* sometimes behaves like a palatal consonant. Pāli has a rule which changes palatals to velars or to retroflexes before consonants. Some root final *s*'s are also affected by this rule. Unless we posit underlying palatal *ś*, we will not be able to account for the alternating velar and retroflex consonants by the rule which already

exists in the grammar of Pāli. To account for its reversion into velar and retroflex, we will have to write another rule, thus complicating the grammar. The following examples show the need of underlying ś's.

	(3rd. sg. fut.)	(3rd. sg. fut.)
	viś + sy + a + ti	bhuj + sy + a + ti
Regular Guṇa	vaiś + sy + a+ ti	bhauj + sy + a + ti
Rev. of Pal.-A	vaik + sy + a + ti	bhaug + sy + a + ti
Mid Vow. Form.	vek + sy + a + ti	bhog + sy + a + ti
Voice Assim.	———	bhok + sy + a + ti
s-Soften.	vek + hy + a + ti	bhok + hy + a + ti
Metathesis	vek + yh + a + ti	bhok + yh + a + ti
y-Assim.	vek + kh + a + ti	bhok + kh + a + ti
	vekkhati	*bhokkhati*

The present forms are *visati* and *bhuñjati*. The latter is a nasal-infix verb. Reversion of Palatals to Velars accounts not only for forms such as *vakkhati* and *bhokkhati* but also for those like *vekkhati* (cp. viś 'dwell'). If we decide to write a separate rule which will change alveolar *s* into velar, the rule will be very unnatural and will have many exceptions. It is much more natural for palatal ś's to change into velars than for alveolars to do so.

The following examples show the need of changing palatals into retroflexes. The past participles of *nasati* 'destroys' and *yajati* 'sacrifices' are *naṭṭha* and *yiṭṭha*, respectively.

	naś + ta	ij + ta
y-Insert.	———	yij + ta
Rever. of Pal.-B	naṭ + ta	yiḍ + ta
Voice Assim.	———	yiṭ + ta
Sib. of Retrofl. Stop	naṣ + ta	yiṣ + ta
Retrofl. Assim.	naṣ + ṭa	yiṣ + ṭa
s-Soften.	nah + ṭa	yih + ṭa
Metathesis	naṭ + ha	yiṭ + ha
h-Assim.	naṭ + ṭha	yiṭ + ṭha
	naṭṭha	*yiṭṭha*

As far as the retroflex *ṣ* is concerned, there is no need of posit-

ing underlying *ṣ* in Pāli just like Saṃskrit. There are two sources which produce retroflex *ṣ*'s. One of them is the s-Retroflexion rule, and the other one is Sibilization of Retroflex Stops. Both the rules are necessary in Pāli to account for alternations, especially for those in past participles, infinitives, and gerunds whose suffixes begin with dental *t*. The past participle suffix is *-ta*, but, in some examples, it is *ṭha*. The latter suffix occurs only after retroflex consonant. This means a sibilant which precedes *-t* has to be a retroflex sibilant. For example :

	is + ta 'desired' (pple.)
s-Retrofl.	iṣ + ta
Retrofl. Assim.	iṣ + ṭa
s-Soften.	ih + ṭa
Metathesis	iṭ + ha
h-Assim.	iṭ + ṭha
	iṭṭha and not **ittha* or **itta*

The following derivation shows that dental *t* in *-ta* becomes retroflex after other retroflex consonants.

	lijh + ta 'written'
Rever. of Pal.-B	liḍh + ta
Barth. Law	liḍh + dha
Retrofl. Assim.	liḍh + ḍha
Retrofl. Lateral.	liḷh + ḷha
Liquid Drop.	lī + ḷha
	līḷha

In Pāli, if there are alveolar *s*'s preceding the pple. suffix *-ta*, the infinitive suffix *-tum*, and the grd. suffix *-tvā*, the suffixes result in *ttha*, *tthum* and *thvā*, respectively, unless the morphemes are marked for the Seṭ i Insertion rule, which inserts *i* before suffixes beginning with *-t*. For example : *nivasati* 'clothes' and its pple. is *nivattha* 'clothed'. The root *us* is an exception to the s-Retroflexion rule.

	(1) ni + us + a + ti	ni + us + ta
Sampr. Guṇa	ni + uas + a + ti	————

Glide Insert.	————	ni + wus + ta
s-Retrofl.	————	
Glide Form.	ni + was + a + ti	————
s-Soften.	————	ni + wuh + ta
Metathesis	————	ni + wut + ha
Fric. of w	ni + vas + a + ti	ni + vut + ha
h-Assim.	————	ni + vut + tha
	nivasati	*nivuttha*

(2) as + ti 'is' (3rd. sg. pres.)

s-Retrofl.	————
s-Soften.	ah + ti
Metathesis	at + hi
h-Assim.	at + thi
	atthi

No palatal *ś* or retroflex *ṣ* is found in the surface structure of Pāli morphemes. There was a retroflexion rule in Skt. which retroflexed alveolar *s*'s when preceded by *r*, *u*, *k*, and *i*. One may say that the rule has been lost in Pāli. Hence, all retroflex sibilants reverted to alveolar. But, then we would not be able to account for retroflex *ṭ*'s which occur after roots which end with alveolar *s*'s by the general retroflex assimilation rule. The s-Retroflexion rule should be in the grammar of Pāli.

Thus, rule loss and restructuring prove to be wrong. To account for the nonappearance of palatal and retroflex sibilants, Pāli must have added a deretroflexion and depalatalization rule to its grammar. This rule is added at the end of phonological component. It expresses an unconditioned sound change and, therefore, argues against Kiparsky's (1968b) claim that the grammar cannot have a synchronic rule which changes sounds everywhere, regardless of environment.

The Phonetic Quality of Pāli Resonants Plus h

In Pāli, *mh*, *nh*, *lh*, *yh*, and *vh* are written as clusters as opposed to *ph*, *th*, etc., which are represented by single symbols. We are not at all sure how Pāli resonants plus *h*'s were pronounced. There are three possibilities. They were either

pronounced as unit phonemes, as clusters, or as geminate aspirates.

Nasals plus h

Nasal resonants plus *h* could have been aspirated nasals, geminate aspirated nasals, or clusters of nasal plus *h* (*mh*, *nh* or *mmh*, *nnh* or *m* + *h*, *n* + *h*). However, some indirect evidence can be brought forth regarding their nature.

As non-clusters :

(1) Consonant clusters do not occur initially since the morpheme structure constraint of Pāli does not allow initial clusters. But *mh* and *nh* are written in initial position. Therefore, they are probably not clusters. Compare this with *ch-* initially and *-cch-* intervocalically, though written *-ch-*. The parallel seems to be:

ch-	-cch-	(written -ch-)
mh-	-mmh-	(written -mh-)
nh-	-nnh-	(written -nh-)

(2) Pāli *ḷh* is a unit phoneme because it comes from the unit phoneme, *ḍh*, and it does not cause shortening of a preceding vowel as other consonant clusters. *ḷh* is written as a cluster even though it is a unit phoneme, indicating that the writing system is totally unreliable on this matter. It would be strange if a language had one aspirate resonant phoneme while all other resonant plus aspiration sequences were clusters.

As geminates:

(1) *mh* and *nh* cause shortening of the preceding vowel. Only clusters cause vowel shortening. Of course, geminates are clusters. For example:

	a + hū + s + ma
s-Soften.	a + hū + h + ma
Metathesis	a + hū + m + ha
h-Assim.	a + hū + m + mha
Vow. Short.	a + hu + m + mha
	ahumha (ahummha)

(2) Saṃskrit *brahman* > *bāmhan* in village Marathi. A vowel is long before *mh*. This is parallel to Skt. *dharma* > *dhām* in Marathi. The historical process was : in Middle Indo Aryan, in cases where a true consonant was followed by a resonant, progressive assimilation and, in the rest of the cases, regressive assimilation took place creating geminate consonants and shortening the preceding vowel. In modern Indo-Aryan, geminates were simplified with compensatory lengthening of the preceding vowel.

OIA. karma > MIA. kamma > Mod. IA. kām

OIA. brahman > MIA. *bammhan (bamhan) > Mod. IA. bāmhan

In some Hindi dialects, the MIA. form *bammhan* is kept. This example indicates that medial *mh* and *nh* were always geminate aspirates, whether they derive from *s* + *m* or *h* + *m*. The fact that *hm* > *mmh* and *hn* > *nnh* support my contention that *st* > *tth* through the intermediate processes of *s* > *h* and metathesis.

(3) Pāli *mh* and *nh* come from Skt. *sm* and *sn*, respectively. This development is parallel to Pāli *tth* or *pph* which come from Skt. *st* and *sp*, respectively. Since *mh* and *nh* are like *tth* and *pph* in origin, and since *tth* and *pph* are geminates, *mh* and *nh* are also geminates i.e. *mmh* and *nnh*, respectively.

Glides plus h

Glides plus *h* seem to be clusters rather than unit or geminate phonemes for the following reasons :

(1) *yh* and *vh* do not occur initially; thus, there is no morpheme structure argument for considering them to be units.

(2) Pāli does not allow geminated *vv*. It would be strange for a language which does not allow *vv* to allow *vvh*. Thus, *yh* and *vh* were probably not geminates.

(3) *yh* and *vh* make position in Pāli versification. Thus, they must be either geminates or clusters.

Pāli Assimilation and Phonological Universals

(1) *Degrees of Sonority (Jespersen)*

More sonorous segments are more likely than less sonorous segments to be found at the peak.

(1) Low vowels — a, ae
(2) Mid vowels — e, ö, ae, o
(3) High vowels — i, ü, ṭ, u
(4) Glides— y, w, w
(5) Liquids — r, l
(6) Nasals — ṃ, ṇ, ṅ
(7) Voiced fricatives
(8) Voiceless fricatives
(9) Voiced stops
(10) Voiceless stops

The position of affricates and glottal sounds (?, h) is problematical. Jespersen put nasals before liquids. But *r̥ l̥* are more common than *m̥, n̥*: for example, English has all four while Saṃskrit has *r̥, l̥* but not *m̥, n̥*.

The lower the degree of sonority, the more likely the segment is to be found at the beginning of a syllable before a vowel. High and mid vowels are more likely to be found before other vowels than are low vowels because low vowels are least readily converted to a glide.

(2) *Degrees of Final Sonority*

Some sounds have more sonority at the end of the segment than at the beginning; others have more at the beginning than at the end. Segments with greater degrees of final sonority are more commonly found after consonants than are segments with lesser degrees of final sonority. Their hierarchy :

1. Vowels
2. Liquids
3. Glides
4. Fricatives
5. Nasals
6. Stops

Initial *ps-* and *ks-* are more common than initial *pn-*, *bn-*, *kn-*, *gn-*, etc. Initial *pr-*, *kr-* are more common than initial *py-*, *pw-*, *ky-*. Initial velar + *w* seems to be more common than any other initial consonant + glide sequences.

(3) *Degrees of Initial Sonority*

Segments of great sonority at the beginning of the segment are more likely to precede consonants than those with less sonority at the beginning of the segments. The order :

1. Vowels
2. Nasals
3. Fricatives
4. Glides
5. Liquids
6. Stops

s seems to be a special segment, ordered before nasals, since initial *sp-*, *st-*, *sk-* are more common than initial *mp-*, *nt-*, *ṅk-*.

Segments of high complexity are extremely rare before consonants and not common after consonants. The order of complexity is :

1. Affricates
2. Aspirates

Both are extremely rare before consonants ; however, Greek has aspirates in that position. Neither are common after consonants, but *-pth-* and *-kth-* are far more common than *-pč-* and *-kč-*. Thus, affricates are more complex than aspirates.

Assimilatory Processes

Assimilatory processes are generally governed by syllable structure. The beginning of a syllable is the strongest part, and assimilation is usually in the direction of the beginning of the syllable. Thus $VC_1.\ C_2V \longrightarrow VC_2C_2V$; $V.C_1C_2V \longrightarrow VC_1C_1V$.

In Pāli, syllables must begin with CV or V. If a syllable began with CCV in Saṃskrit, the second consonant is uniformly assimilated to the first. Example :

(1) Skt. jvalati > Pāli (jjalati) jalati 'burns'
(2) Skt. śvaśru > Pāli sassu 'mother-in-law'
(3) Skt. trāṇa > Pāli tāṇa 'protection'
(4) Skt. nagna > Pāli nagga 'naked'
(5) Skt. putra > Pāli putta 'son'
(6) Skt. lagyati > Pāli laggati 'sticks'

(7) Skt. pakva > Pāli pakka 'ripe'
(8) Skt. cakra > Pāli cakka 'wheel'
(9) Skt. prati > Pāli paṭi 'against'
(10) Skt. kramati > Pāli kamati 'walks'

Languages having regressive assimilation assimilate consonants at the end of a syllable having a degree of final sonority less than some arbitrary value to the first consonant of the next syllable. Languages may assimilate stops but not liquids or nasals, as in Italian, or stops and liquids but not nasals, as in Pāli. On the other hand, no language will completely assimilate liquids without assimilating stops, or nasals without assimilating liquids and stops. Examples of regressive assimilation :

I. Stop + Stop

(1) Skt. mudga > Pāli mugga 'bean'
(2) Skt. sakthi > Pāli satthi 'thigh'
(3) Skt. bhakta > Pāli bhatta 'rice'
(4) Skt. śabda > Pāli sadda 'words'
(5) Skt. sapta > Pāli satta 'seven'
(6) Skt. dugdha > Pāli duddha 'milk'

II. Liquid + Stop

(1) Skt. karka > Pāli kakka 'a precious stone'
(2) Skt. sarpa > Pāli sappa 'snake'
(3) Skt. valka > Pāli vakka 'the bark of a tree'
vāka
(4) Skt. kilbiṣa > Pāli kibbisa 'sin'

III. Liquid + Fricative

(1) Skt. karṣaka > Pāli kassaka 'farmer'
(2) Skt. sparsa > Pāli phassa 'touch'

IV. Liquid + Nasal

(1) Skt. kalmāṣa > Pāli kammāsa 'spotted'
(2) Skt. ūrmi > Pāli ūmi 'wave'
(3) Skt. dharma > Pāli dhamma 'righteousness'
(4) Skt. karṇa > Pāli kaṇṇa 'ear'

V. Liquid + Glide

(1) Skt. niryāti > Pāli niyyāti 'goes away'
(2) Skt. niryāma > Pāli niyyāma 'sailor'
But :

Nasal + Stop

(1) Skt. danta > Pāli danta 'tamed'
(2) Skt. sambuddha > Pāli sambuddha 'enlightened'
(3) Skt. sannidhāna > Pāli sannidhāna 'putting together'

In syllable division, *l* is less resonant than *r*. In Indic, *v* is less resonant than *y* and also than *l* and *r* since *v* is midway between glide and obstruent. Thus *ly*, *vr*, *vy* may begin syllables, but not *yv*, *rv*, *lv*, *yr*, *ry*, *rl*.

In assimilation *ly* > *ll*, *vr* > *vv*, *vy* > *vv*, but *rv* > *vv*, *lv* > *ll*. Examples :

(1) Skt. kalya > Pāli kalla 'ready, possible'
(2) Skt. vrata > Pāli (vvata) > vata 'religious observance'
(3) Skt. tīvra > Pāli (tivva) > tibba 'sharp'
(4) Skt. parivyaya > Pāli (parivvaya) paribbaya 'expenditure'

But :

(1) Skt. parvata > Pāli pabbata 'mountain'
(2) Skt. bilva > Pāli bella 'a kind of fruit'

Nasals and preceding stops are most likely to have the syllable division between them if they agree in voicing and place of articulation. Thus V.knV, V.gnV, V.tnV, V.pnV; V. bnV; but Vd. nV and Vj.ñV. Thus *kn* > *kk*, *gn* > *gg*, *tn* > *tt*, *pn* > *pp*, *bn* > *bb*; but *dn* > *nn* and *jñ* > *ññ*. Examples :

(1) Skt. śaknoti > Pāli sakkoti 'is able'
(2) Skt. lagna > Pāli lagga 'touch'
(3) Skt. sapatni > Pāli sapatti 'co-wife'
(4) Skt. āpnoti > Pāli appoti 'obtains'

But :

(1) Skt. rājñā > Pāli raññā 'king' (inst. sg.)

s and h

There is a special relation between *s* and *h* in natural languages. *s* is more likely to change to *h* than to anything else except other sibilants. The environment where *s* is most likely to become *h* is problematical. In Greek, *s* > *h* in the

vicinity of vowels : **so* > *ho*; **genesos* > **genehos* > *geneos*; but *sp* and *ps* remain. In French and Spanish, *s* > *h* in the vicinity of consonants : *studiare* > O. F. *estudier* > **ehtudier* > N.F. *étudier*; Sp. *éste*, Caribbean Sp. *ĕhte*. The Pāli development resembles the French and Spanish developments.

h is very unnatural at the end of a syllable and is usually removed from that position. This can be accomplished by : (1) dropping *h* (French); (2) inserting a vowel (Marathi); (3) metathesis (Pāli).

Stops+*h* tend to coalesce as aspirates. Thus Gk. *ek*>*ekh* before a root beginning with *h*. In Pāli, the same process took place. Thus $t + h > t^h$, etc. Intervocalically, a geminate resulted in order to preserve the length of the syllable. The first syllable of *atha* is long by position. *atha* may not become at^ha, with a short first syllable; it must become att^ha, with a long first syllable.

CHAPTER IV

RELATION BETWEEN SKT. AND PĀLI PHONOLOGY

Pāli is a descendant of one of the dialects of Old Indo-Aryan. The structure of Old Indo-Aryan is basically the structure of Skt. Hence, Pāli is related to Skt. in phonology and morphology. In most of the cases, Pāli has the same underlying forms as in Skt. Pāli also has inherited a number of phonological rules from Skt. Most of these rules have the same forms as in Skt. However, the structure of Pāli, on the whole, seems to be a lot more simpler than the structure of Skt. The simplification in the structure of Pāli is due to two reasons, the change in the underlying forms caused by restructuring, and the change in the rules. This chapter deals with the underlying forms and the rules, both in Pāli and Saṃskrit.

I. *Underlying Forms in Pāli and Saṃskrit*

1. *Root Initial Geminates in Pāli*

In Pāli, many roots begin with initial geminates, if they are preceded by prefixes, but with single consonants if no prefixes are present.

For example :

1. gahati 'seizes' ni-ggahati 'refutes'
2. kamati 'walks, goes' apa-kkamati 'goes off'

In this section, we will discuss the appropriate underlying representation of geminates. In Pāli, initial geminates can be posited as : (1) C + r; (2) C + C; (3) C + l; (4) C + *y*; and (5) C + w. Among the five alternatives, only the first seems synchronically correct. *r* can produce geminates from *Cr* clusters by the r-Assimilation rule, which is, anyway, needed in the grammar. r-Assimilation rule is necessary for alternations of this type.

1. reka 'emission' uddeka 'vomit' (noun)
2. upagaṇhāti 'grasps' upaggahi (3rd. sg. aor.)
3. suṇāti 'hears' assosi (3rd. sg. aor.)

Derivations :

	(1) ud + reka ud + deka *uddeka*
r-Assim.	

	(2) upa+grjh+nā+ti	upa+grjh+i
Sampr. Guṇa	.....	upa+grajh+i
n-Retrofl.	upa+grjh+ṇā+ti	.....
Syl. of Res.	upa+grjh+ṇā+ti	.....
Fate of Syl. Res.	upa+gajh+ṇā+ti	.....
r-Assim.	.....	upa+ggajh+i
Weak. of Vcd. Aff.	upa+gah+ṇā+ti	upa+ggah+i
Metathesis	upa+gaṇ+hā+ti	.....
	upagaṇhāti	*upaggahi*

Since r-Assimilation is independently motivated, roots beginning with *CC* or *CCh* after prefixes can be posited with underlying C(h)r. For example, *ppaṭi/paṭi* can be posited as *praṭi*. r-Assimilation will automatically produce the desired forms.

It is necessary to posit initial *Cr* clusters in many cases, especially to account for the occurrences of retroflex *ṣ*'s and retroflex *ṇ*'s. The retroflexion of sibilants and nasals is caused by an *r* which precedes them. For example :

1. sru 'hear' suṇoti 'hears'
2. grjh 'grab' gaṇhāti 'seizes'
3. tir 'cross' tiṇṇa 'crossed'
4. cir 'practice' ciṇṇa 'practiced'
5. krs 'plough' kaṭṭha 'ploughed'
6. drś 'see' daṭṭha 'seen'

Some roots have *CCaC/CaC* alternations. *CCaC*<*CraC*, *CaC*<*CrC*. the vowel *a* in the sequence *CCaC* is inserted by the Samprasāraṇa Guṇa rule. This rule inserts an *a* after a resonant. In the alternative form, Samprasāraṇa Guṇa does not take place, and the same resonant becomes syllabic due to

its occurrence between two consonants. Consider the following example : *gaṇhāti* 'grasps' *aggahi* (3rd. sg. aor.). The underlying form of *gaṇhāti* is *grjh-nā-ti*, *grjh* > *gr̥jh* > *gah*. The underlying form of *aggahi* is *a+grajh+i*. *r* assimilates to *g*, and *gg* is produced. In verbs showing obvious Guṇa alternations (u/o or u/va), Guṇa almost always appears in the aorist and never appears in nasal present classes. The fact that a geminate is found where Guṇa would be expected, and that a simple consonant is found where Guṇa never appears, is a regularity which must be expressed by the grammar.

Most roots beginning with *CC* or *CCh* after prefixes do not show alternations of the above type. They do not need *r*'s to explain their development. One can posit geminates in such cases. Initial geminates will be reduced to a single consonant by the global constraint. For example :

	kamati 'walks'	pakkamati 'goes away'
	kkam + a+ti	pa + kkam + a + ti
Gem. Red.	kam + a + ti	.....
	kamati	*pakkamati*

Also, some roots beginning with *CC* are historically from *Cl*, *Cy*, or *Cv* and not just from *Cr*. To posit an underlying *r* in *pavati*, for example, which alternates with *ppavati* and is from Skt. *plavati*, would seem to fly in the face of the history of the word.

Synchronic grammar is supposed to account for alternations in the simplest way possible. If positing *Cr* is the best and simplest way to account for the alternations, the knowledge of historical *Cl*, *Cy*, and *Cw* is irrelevant. It would be best to try to account for the C/CC alternations with a single underlying representation. We cannot posit initial *Cy*, *Cl*, or *Cv* in all such cases. We cannot posit *Cy* since a palatalization rule exists in Pāli which will change *ty*, *thy* *dy* and *dhy* into *Cy* *Chy*, *jy* and *jhy* respectively, thus preventing us from producing *tt* or *dd*. It is not possible to posit underlying *Cl* since an l-Assimilation rule cannot be justified on non-historical grounds. The underlying representation *Cv* cannot be justified since *v* does not assimilate to *t*. (The gerund suffix is — *tvā*.) The only choices remaining are underlying *Cr* and underlying geminates. If we posit under-

lying geminates, the morpheme structure rule of Pāli would have to state that the initial clusters of Pāli must be geminate or *Cr*. The morpheme structure rule would be of the following type :

$$[+\text{seg}] \longrightarrow \left\{ \begin{bmatrix} -\text{obs} \\ +\text{cnt} \end{bmatrix}, \begin{bmatrix} \alpha\text{cns} \\ \beta\text{syl} \\ \gamma\text{grv} \\ \delta\text{high} \\ \epsilon\text{cnt} \\ \zeta\text{nas} \\ \eta\text{str} \\ \theta\text{tns} \\ \tau\text{vcd} \end{bmatrix} \right\} \Big/ \begin{bmatrix} \alpha\text{cns} \\ \beta\text{syl} \\ \gamma\text{grv} \\ \delta\text{high} \\ \epsilon\text{cnt} \\ \zeta\text{nas} \\ \eta\text{str} \\ \theta\text{tns} \\ \tau\text{vcd} \end{bmatrix} \text{———}$$

If all the geminates are posited as Cr, the morpheme structure rule will be :

$$[+\text{seg}] \longrightarrow \begin{bmatrix} -\text{obs} \\ +\text{cnt} \end{bmatrix} \Big/ [+\text{obs}] \text{———}$$

This rule is much simpler. Positing *CC* complicates the morpheme structure rule since we already have to have a *Cr* cluster. It is much simpler to restrict initial consonant clusters to *Cr* than to restrict them to *CCr* or geminates. Initial *Cr* is much more natural than initial geminates.

The morpheme structure constraints for initial consonant clusters are much simpler in Pāli than in Saṃskrit. Pāli allows only *Cr*. Skt. allows not only *Cr*, *Cy*, *Cl*, *Cw* but also *SCC* and *Cs*. For example :

	Skt.	Pāli
str̥ṇāti	'strews'	————
styāyate	'stiffens'	————
kṣamati	'endures'	khamati
psāti	'devour'	chāti
tsarati	'approaches stealthily'	(lost)

Morpheme structure considerations and the need for the synchronic r-Assimilation rule to account for the CCaC/CaC

alternations justify positing an underlying #Cr or initial geminates. The initial geminates cannot be underlying #CC, #Cl, #Cy and #Cw, since they cannot be justified by any synchronic criterion.

2. *The Structure of the Verbal Root*

In Pāli, if a verbal root begins with a consonant, the second segment must be a resonant or a vowel. Some of the Saṃskrit roots, however, contained no vowels; for example,

	Root	2nd. sg. Perf.	3rd. pl. Perf.
1. kr	'do'	cakartha	cakrur
2. pt	'fall'	papattha	paptur
3. tud	'strike'	tutoditha	tutudur
4. nī	'lead'	nīnetha	nīnyur
5. stu	'praise'	tuṣṭotha	tuṣṭuvur

Some Skt. derivations :

	(1) pt+tha	pt+ur
Guṇa	pat+tha	———
Redupl.	pa+pat+tha	pa+pt+ur
	papattha	*paptur*
	(2) stu+tha	stu+ur
Guṇa.	stau+tha	———
Redupl.	tu+stau+tha	tu+stu+ur
s-Retrofl.	tu+ṣtau+tha	tu+ṣtu+ur
Glide Form.	———	tu+ṣtw+ur
Mid Vow. Form	tu+ṣto+tha	———
Retrofl. Assim.	tu+ṣṭo+tha	tu+ṣṭw+ur
Vowel Insert.	———	tu+ṣṭuwur
	tuṣṭotha	*tuṣṭuvur*

(Note : The 3rd. pl. suffix *-ur* is exempt from Like Vowel Coalescence. Thus, *u+ur>vur*, not *ūr*.)

In Skt., roots like *pt* have often been mistakenly posited as *pat* because the form *pat* occurs quite often where the weak form of the root would be expected. For example, the pple. is *patitá*

instead of **ptitá*. Compare present *vásati*, pple. *uṣitá*. Whenever Guṇa does not regularly apply and an unacceptable initial cluster results, that cluster is broken by inserting *a*. The *a* in *patita* is such an inserted vowel ; it is not a guṇating vowel or part of the root.

The structure of verbal roots became more natural in Pāli. If the verb root begins with a consonant, it must be followed by a resonant or by a vowel. Since the principle evidence for *pt* in Skt. is the perfect, and since Pāli does not have perfect (except for three or four verbs), it seems that Pāli has restructured verbs like *pt* into forms like *pat*. Guṇa and Vr̥ddhi applies only to resonants in Pāli, whereas it applies to obstruents in Skt.

3. *High Vowels*

(1) The structure of the Skt. verbal root is simplified if we posit glides (*w* and *y*) instead of high vowels (*u* and *i*).

Skt. verb roots can consist of *cc*, *iC*, *uC*, *Ci*, *Cu*, *CCC*, *iCC*, *uCC*, *CiC*, *CuC*, *CCi CCu*, but never **Ca*, **aC*, etc. (Roots of the type *Cā/Ci* will be handled later.) If we consider *i* and *u* to be underlying *y* and *w*, the structure of verbal roots can be defined simply as *CC(C)*.

Examples of each type of root follow :

CC : rdh 'thrive', pt 'fall', km 'love', gm 'go'
iC : ij 'offer' im 'reach'
uC : uc 'say', us 'live', ud 'speak'
Ci : ci 'gather', ji 'conquer', mi 'fix', hi 'impel'
Cu : gu 'sound', ru 'cry', su 'press out', hu 'sacrifice'
CCC : krm 'stride', klm 'be weary', ksd 'divide', ksn 'wound', kmp 'tremble', grj 'roar', grdh 'be greedy', ckṣ 'see', tkṣ 'fashion', prd 'pedere'
iCC : (No examples are found.)
uCC : ukṣ 'increase', ulg 'spring', ulh 'challenge'
CiC : khid 'tear', cit 'think', chid 'cut', tij 'be sharp', tim 'be quiet'. diś 'point', ric 'leave', rikh 'scratch', lih 'lick', śiṣ, 'leave', sic 'pour out', sidh 'repell'
CuC : (Most common) tud strike', kuc 'shrink', kuth 'strike', kup 'be angry', kuṣ 'tear', gup 'protect' guph 'twine', ghuṣ 'sound', cud 'impell,' cup 'stir', juṣ 'enjoy', tuj 'urge'

CCi: jri 'go'
CCu : kṣu 'sneeze', dru 'run', pru 'flow', plu 'float', sru 'flow'

(2) The Guṇa rule is simplified if Skt. *i* and *u* are posited as *y* and *w*, respectively. In the case of underlying *i* and *u*, the Guṇa rule for two segment roots is as follows.

The vowel *a* is inserted between two consonants, between a high vowel and a consonant, between a consonant and high vowel and between two high vowels in two segment roots.

$$\phi \longrightarrow \begin{bmatrix} +\text{syl} \\ +\text{low} \\ -\text{lng} \end{bmatrix} / \left\{ \begin{bmatrix} -\text{cns} \\ +\text{syl} \\ +\text{high} \end{bmatrix} \right\} \text{——} \left\{ \begin{bmatrix} -\text{cns} \\ +\text{syl} \\ +\text{high} \end{bmatrix} \right\}$$

$$\left\{ \begin{bmatrix} -\text{cns} \\ +\text{syl} \\ +\text{high} \end{bmatrix} \right\} \text{——} \left\{ \begin{bmatrix} -\text{cns} \\ +\text{syl} \\ +\text{high} \end{bmatrix} \right\}$$

$$[\ +\text{cns}\ ] \qquad [\ +\text{cns}\ ]$$

Examples :

(i) pt ⟶ pat
(ii) ij ⟶ iaj ⟶ yaj
(iii) us ⟶ uas ⟶ vas
(iv) ji ⟶ jai ⟶ jay
(v) gu⟶ gau ⟶ gav

Following are the rules for three segment roots : Regular Guṇa : In three segment roots, the vowel *a* is inserted after the first segment. The first segment may be a consonant or a high vowel, while the second and third segments may be either consonants or high vowels, or a high vowel and a consonant, or a consonant and a high vowel.

$$\phi \longrightarrow \begin{bmatrix} +\text{syl} \\ +\text{low} \\ -\text{lng} \end{bmatrix} / \left\{ \begin{bmatrix} -\text{cns} \\ +\text{syl} \\ +\text{high} \end{bmatrix} \right\} \text{—} \left\{ \begin{bmatrix} -\text{cns} \\ +\text{syl} \\ +\text{high} \end{bmatrix} \right\} \left\{ \begin{bmatrix} -\text{cns} \\ +\text{syl} \\ +\text{high} \end{bmatrix} \right\}$$

$$[\ +\text{cns}\ ] \qquad [\ +\text{cns}\ ] \qquad [\ +\text{cns}\ ]$$

Examples :

(i) grj ⟶ garj
(ii) gup ⟶ gaup ⟶ gop

(iii) sidh ⟶ saidh ⟶ sedh
(iv) ulg ⟶ ualg ⟶ valg
(v) tij ⟶ taij ⟶ tej

Samprasāraṇa Guṇa : In Samprasāraṇa Guṇa, the vowel *a* is inserted before the final segment and after the first two segments. These segments may be consonants, high vowels, a consonant and high vowels, high vowels and a consonant, consonants and a high vowel, or a high vowel and consonants.

$$\phi \longrightarrow \begin{bmatrix} +\text{syl} \\ +\text{low} \\ -\text{lng} \end{bmatrix} / \left\{ \begin{bmatrix} -\text{cns} \\ +\text{syl} \\ +\text{high} \end{bmatrix} \right\} \left\{ \begin{bmatrix} -\text{cns} \\ +\text{syl} \\ +\text{high} \end{bmatrix} \right\} - \left\{ \begin{bmatrix} -\text{cns} \\ +\text{syl} \\ +\text{high} \end{bmatrix} \right\}$$
$$\left[+\text{cns} \right] \qquad \left[+\text{cns} \right]$$

Examples :

(i) jri ⟶ jrai ⟶ jray (before the suffix *a*-ti)
(ii) plu ⟶ plau ⟶ plav (before the suffix *a*-ti)
(iii) sru ⟶ srau ⟶ srav (before the suffix *a*-ti)
(iv) iuj ⟶ iuaj ⟶ iunaj ⟶yunaj ⟶ yunak
by Reversion of Palatals (before the suffix -ti)

If we posit underlying *y* and *w*, the Guṇa rules will be much simpler. Compare the following Guṇa rules with the ones above.

$$\phi \longrightarrow \begin{bmatrix} +\text{syl} \\ +\text{low} \\ -\text{lng} \end{bmatrix} / \quad \text{C} - \text{C}$$

$$\phi \longrightarrow \begin{bmatrix} +\text{syl} \\ +\text{low} \\ -\text{lng} \end{bmatrix} / \quad \text{C} - \text{CC}$$

$$\phi \longrightarrow \begin{bmatrix} +\text{syl} \\ +\text{low} \\ -\text{lng} \end{bmatrix} / \quad \text{CC} - \text{C} \Big]_{\substack{\text{Root} \\ [+\text{Samprasāraṇa}]}}$$

Saṃskrit also had a few roots of the type *CCCC*. Their Guṇa rule was as follows :

$$\phi \longrightarrow \begin{bmatrix} +\text{syl} \\ +\text{low} \\ -\text{lng} \end{bmatrix} \;/\; \text{CC} - \text{CC}$$

(3) Positing *y* and *w* for *i* and *u* simplifies the n-Insertion rule.

Following is the n-Insertion rule as it would have to be stated if we have underlying *i*, *u* instead of *y*, *w*.

$$\phi \longrightarrow \begin{bmatrix} +\text{cns} \\ +\text{nas} \end{bmatrix} \;/\; \text{——} \left\{ \begin{bmatrix} -\text{cns} \\ +\text{syl} \\ +\text{high} \end{bmatrix} \right\} \begin{bmatrix} +\text{cns} \end{bmatrix} \Bigg]$$

Root
[+n-Insert.]

This rule states that *n* is inserted before the final *u*, *i*, or consonant in the roots marked for n-Insertion.

If *y*, *w* are posited, the rule will be :

$$\phi \longrightarrow \begin{bmatrix} +\text{cns} \\ +\text{nas} \end{bmatrix} \;/\; \text{——} \;\; \text{C} \Bigg]$$

Root
[+n-Insert.]

y and *w* are represented by *C*. Hence, there is no need of writing the separate environment. Thus, this rule becomes simpler than the one above. Following are some derivations :

	(1)	ryc + ty	ryc + anty
n-Insert.		rync + ty	rync + anty
Sampr. Guṇa		rynac + ty	———
(Note, no Guṇa in the pl. of athematic verbs.)			
Rever. of Pal.		rynak + ty	———
Syl. of Res.		rinak + ti	rinc + anti

n-Retrofl.	riṇak + ti	riṇc + anti
Nasal Assim.	.....	riñc + anti
	riṇakti	*riñcanti*
	(2) śrw + ty	śrw + anty
n-Insert.	śrnw + ty	śrnw + anty
Guṇa	śrnaw + ty	.....
Syl. of Res.	śr̥naw + ti	śr̥nw + anti
n-Retrofl.	śr̥ṇaw + ti	śr̥ṇw + anti
Mid Vow. Form.	śr̥ṇo + ti	śr̥ṇw + anti
	śr̥ṇoti	*śr̥ṇvanti*

(Note : Inserted nasals are [—Syl. of Res.])

Once we posit *y* and *w* in underlying representations, the distinction between *n* class and *no* class disappears.

(4) There is also a need of positing underlying *y*, *w*. Syllabification of resonants will not work otherwise. Besides, the alternations *i*/*y* and *u*/*w* are totally parallel to the alternations r̥/*r*, l̥/*l*, *a*/*n* and *a*/*m*

Syllabification of Resonants must be applied from right to left. Whenever a resonant is found in an impossible position, it becomes syllabic. Impossible position can be defined as : (1) *y* between two consonants, consonant and word boundary, or word boundary and consonant; (2) *w* between two consonants unless the second consonant is *y* or *r* and the first consonant is a resonant, or between word boundary and a consonant other than *y* or *r*, or between consonant and word boundary; and (3) *r*, *l* and nasals between two consonants unless the second consonant is a glide, or between a word boundary and a consonant, or between a consonant and a word boundary. There are three exceptions to the Syllabification process. First, *y*, *w*, and *r* in noninitial syllables become *i*, *ū*, r̥, before final *ns*. This rule must be ordered before Syllabification of Resonants; otherwise, the *n* would syllabify and *y*, *w*, *r* would remain. Second, both initial *wr* and initial *ur* exist. Third, inserted nasals are exempted from syllabification.

The following order of rules explains the derivations to follow :

1 Lengthening Before Final ns
2 Syllabification of Resonants
3 Mid Vowel Formation
4 Simplification of Final Clusters
5 Palatalization of Nasals

Some examples and their derivations :

	gen. loc. dual	acc. pl.	ins. pl.
(1)	agny+aws	agny+ ns	agny+bhys
Length. Bef.ns	——	agny	———
Syl. of Res.	——	agnī+ns	agnibhis
Mid. Vow. Form.	agnyos	——	———
Simpl. of Fin Cl.	——	agnī+n	———
	agnyos	*agnīn*	*agnibhis*
	gen. loc. dual	acc. pl.	ins. pl.
(2)	śatrw+aws	śatrw+ns	śatrw+bhys
Length. Bef.ns	——	śatrw̄+ns	———
Syl. of Res.	——	śatrū+ns	śatru+bhis
Mid Vow. Form.	śatrw+os	——	———
Simpl. of Fin. Cl.	——	śatrū+n	———
	śatrwos	*śatrūn*	*śatrubhis*

Note : Neither *n* in *agnyos* nor *r* in *śatrwos* is syllabic because they are not in impossible positions.

	gen. loc. dual.	acc. pl.	ins. pl.
(3)	swasr+aws	swasr+ns	swasr+bhys
Length. Bef.ns	——	swasr̄+ns	———
Syl. of Res.	swasr+aws	swasr̥+ns	swasr̥+bhis
Mid. Vow. Form.	swasr+os	——	———

Simpl. of Fin. Cl.	——	swasr̥+n	———
	swasros	*swasṛn*	*swasrbhis*
	gen. loc. dual.	acc.pl.	ins. pl.
(4)	rājn+aws	rājn+ns	rājn+bhys
Length. Bef. ns	——	——	———
Syl. of Res.	——	rājn+as	rāja+bhis
Mid. Vow. Form.	rājn+os	——	———
Palatal. of Nas.	rājñ+os	rājñ+as	———
	rājños	*rājñas*	*rājabhis*
	gen. loc. dual.	acc. pl.	ins. pl.
(5)	śwn+aws	śwn+ns	śwn+bhys
Length. Bef. ns	——	——	———
Syl. of Res.	śun+aws	śun+as	śwa+bhis
Mid Vow. Form.	śun+os	——	———
Simpl. of Fin. Cl.	——	——	———
	śunos	*śunas*	*śwabhis* (not *śumbhis)

If we posit underlying *u* instead of *w*, it would be extremely difficult to state a rule converting underlying *śun+bhis* to *śwabhis*; also the unnatural rule, u ——〉 w/-nC, will result.

4. *Restructuring of Glides to High Vowels*

Restructuring of glides to high vowels was already beginning to take place in Skt. There are several reasons for this restructuring.

All resonants except the inserted nasals underwent the Syllabification of Resonants rule, including original nasals. For example :

(1) ywnj+anty ——〉 yuñjanti
(2) śwn+bhys ——〉 śwabhis

In the first example, *n* is in an impossible position. Therefore, it ought to undergo Syllabification of Resonants; but, since it is an inserted *n*, it is an exception. The failure of the *n* to syllabify has left *w* in an impossible position, causing it to become *u*. In the second example, however, *n* is part of the root and, therefore, undergoes the rule, Syllabification of Resonants, becoming *a*. Thus the non-applicability of the Syllabification of Resonants rule to inserted *n*'s has created an imbalance in the structure. To resolve this imbalance, restructuring took place. *w* was restructured as underlying *u*. If *yuñjanti* contains an underlying *u*, the environment for Syllabification of *n* is not met. If all *w*'s are restructured to *u*, however, we cannot account for the form, *śwabhis*, with the syllabification of Resonants rule. This problem is solved by further restructuring and the addition of two new rules. *n* stems were restructured as *an* stems. For example, śwn → śuan, rājn → rājan, etc. The alternations involving *n* stems then required the following rules.

(1) $a \rightarrow \phi$ / V (C) —— n + V

Example : śuan + ai → śune (dat. sg.)

(2) $n \rightarrow \phi$ / —— + C

Example : śuan + bhis → śuabhis→śwabhis
Evidence that this rule was taking over is provided by the *in* stems :

balin + bhis → *balibhis*, not **balyabhis*

Most *n*-stems have Vrddhi in the strong cases. This was reinterpreted as a Guṇa of *an*.

	rājan +am
Guṇa	rājaan+am
Like Vow. Coales.	rājān +am
	rājānam

Nouns could be formed from Saṃskrit roots by the addition of consonants. Verbs, in turn, could be formed from these nouns. Not all such verbs added the denominative suffix; some of them were formally indistinguishable from root verbs except for their

length. Eventually, some original roots were lost, but the derived forms remained. Then the derived forms were not divisible into morphemes, resulting in new roots not of the familiar CC(C(C)) pattern. Roots began to become longer and longer and their structure more difficult to define, resulting in less evidence in favor of underlying *y* and *w* instead of *i* and *u*.

Guṇa was extended into forms where it did not belong. For example, *ws* 'live' has regular alternations: *vásati* (3rd. sg. pres)./ *uvāsa* (3rd. sg. perf.) / *usita* (pple.); *ws* 'clothe', on the other hand, has *a* between *w* and *s* in all its forms. No alternations of this verb are found. Compare *vasate* (3rd. sg. pres.) / *vavase* (3rd. sg. perf.) / *vasita* (pple.). Once the Guṇa vowel *a* was extended in verbs of the type *ws* 'clothe', the underlying forms of some roots were restructured to contain vowels. Once *a* was possible, *i* and *u* were also possible. The morpheme structure rules had to permit vowels.

Inserted nasals were restructured as part of the root in certain verbs. Thus, *nind* is really *nid* with *a* nasal infix, as can be shown by derived nouns such as *nid*, *nidā*, *nedya*; but, the *n* was extended to all forms of the conjugation. For example, *nininda* (perf.), *nindita* (pple.). When this had happened, the root was restructured as *nind*. The new root, *nind*, could not be underlying *nynd* because the *n* no longer is an inserted *n* and, hence, would be subject to syllabification.

The result of restructuring was a considerable complication of the grammar. But, restructuring also made roots more natural, i.e., more pronouncable. This restructuring was complete by the time of Pāli. It left a trace, however, in the feature [+resonant] needed in the Pāli, Guṇa and Vṛddhi rules. The feature resonant forms a natural class of *y*, *i̯*, *w*, *u*, *r*, *r̥*, *l*, *l̥*, *m*, *m̥*, *n*, and *n̥*. The Guṇa rule inserts the vowel *a*, and the Vṛddhi rule *ā*, before a segment which is [+resonant]. It would have been difficult to write the Guṇa and Vṛddhi rules without the feature resonant. However, [—resonant] does not form a natural class. [—resonant] will include obstruents and non-high vowels. Therefore, the use of [—resonant] should be excluded by the metatheory.

5. *Laryngeal*

Indo-European had some underlying consonants which never appear in the surface structure of any IE. language except Hittite. These consonants are called laryngeals. Hittite has two surface laryngeals. The IE. laryngeals not only explain the surface laryngeals in Hittite but also some alternations in other IE. languages. We do not have any idea as regards to their pronunciation, although some linguists like Sapir and Sturtevant tried to define them phonetically. IE. is thought to have had at least three laryngeals, one coalesced with a preceding vowel giving $\bar{e}$, the second coalesced with a preceding vowel giving $\bar{a}$, and the third resulted in $\bar{o}$ after coalescing with a preceding vowel. IE. can be thought of having only one vowel, *e*, in its underlying representations. Thus, $\bar{e}$, $\bar{a}$, and $\bar{o}$ are derived from *e* by positing underlying laryngeals and coalescing them with *e*.

In Skt. there is a need of positing an underlying consonant which does not appear in the surface forms. The need to posit such a consonant in Skt. is due to the fact that alternations such as $\phi \sim i$ or $i \sim \bar{a}$, $in\bar{a} \sim ini \sim in \sim \bar{i}$, or $un\bar{a} \sim uni \sim un \sim \bar{u}$ cannot be handled in any other way. In addition, positing such a consonant enables us to combine all the nasal classes into one. It also explains why all the *nā* class verbs have either *i*, $\bar{i}$, or a long vowel in past participles. This consonant, which will be called laryngeal, has different realizations, depending on the environment. It partially corresponds to the IE. "laryngeals," posited by Saussure (1827). However, the purpose for positing such a consonant is not to explain the history of Skt., but to account for some alternations in the simplest way possible. Although the laryngeal posited here, in some respects reflects IE. laryngeals, it does not go back to the historical laryngeals, because the laryngeals have since been completely restructured in Skt. This is in conformity with King's (1968, p. 103) argument "the synchronic description need not recapitulate the history of the language". Thus positing the laryngeal in the underlying forms of Skt. is in accord with current linguistic theory (cf. Chomsky and Halle's A, E, O in Sound Pattern of English).

Historically, in Skt., IE. laryngeals had the property of aspirating preceding consonants in a particular environment. Because of the regularization of aspiration which resulted in the loss of alternations between aspirated and unaspirated consonants, it is not necessary to attribute to the laryngeal the property of aspirating a preceding consonant. Consider the following example :

(1) patX—ta → patita
(2) mathX—ta → mathita

In fact, we would not want to attribute the property of aspiration to this element in a synchronic description. If we were to do so we would arrive at the incorrect form **pathita*. Following are the ordered statements about laryngeals :

(1) The laryngeal is disregarded in applying Syllabification of Resonants.

(2) Sometimes RXVC—→RVXC, especially in roots in —yXw and in the sg. of *i* and *ī* stems.

(3) It drops with compensatory lengthening in the environment V—C.

(4) It becomes *a* in the environment #—CC if the two *C*'s are not a possible initial cluster.

(5) It becomes *i* or *i* in the environment C—C.

(6) It drops initially and before vowels.

The following are examples, with their derivations, where the application of the above statements or rules properly handle the alternations.

pnthX 'road'

	nom. sg.	acc. sg.	ins. sg.	dat. sg.	loc. sg.
	pnthX+s	pnthX	pnthX	pnthX	pnthX
		+m	+ā	+as	+y
Guṇa	panthaX+s	panthaX	——	——	——
		+m			
Syl. of Res.	———	———	pathX	pathX	pathX
			+ā	+as	+i
Drop. of X/V-	panthā+s	panthām	——	——	——
Drop. of X/-V	———	———	pathā	pathas	pathi
	panthās	*panthām*	*pathā*	*pathas*	*pathi*

The strong cases of this noun have double Guṇa, in the root and in the suffix. (The laryngeal is a noun forming suffix.) When the Guṇating vowel is added before the laryngeal, *ā* results. On the other hand, the other three forms given here are weak cases and have no Guṇa. Since the suffix begins with a vowel, the laryngeal is dropped.

	nom. pl.	acc. pl.	ins. pl.	dat. pl.	loc. pl.
	pnthX	pnthX	pnthX	pnthX	pnthX
	+as	+ns	+bhys	+bhyas	—su
Guṇa	panthaX	———	——	——	——
	+as				
Syl. of Res.	———	pathX	pathX	pathX	pathX
		+as	+bhis	+bhyas	+su
X—→ i	———	———	pathi	pathi	pathi
			+bhis	+bhyas	+su
Drop. of X/—V	pantha+as	path+as	——	——	——
s-Retrofl	———	———	——	——	pathiṣu
Like Vow. Coales.	panthās	———	——	——	——
	panthās	*pathas*	*pathibhis*	*pathibhyas*	*pathiṣu*

Note the forms *pathibhis*, *pathibhyas and pathiṣu*. All of these have the vowel *i*, which was originally the laryngeal. Here there is no Guṇa because the cases are weak, but the suffix begins with a consonant. Hence, the laryngeal appears between two consonants and is syllabified. Consider some of the verb forms.

sthX 'stand'

	3rd. sg. pres.	pple.	2nd. sg. perf.
	sthX+ty	sthX+ta	sthX+tha
Guṇa	sthX+aty	———	sthaX+tha
Syl. of Res.	sthX+ati	———	———
Redupl.	ti+sthX+ati	———	ta+sthaX+tha
Drop. of X/V—	———	———	tasthā+tha
X—→ i	———	sthi+ta	———
Drop. of X/—V	tisth+ati	———	———
s-Retrofl.	tiṣth+ati	———	———
Retrofl. Assim.	tiṣṭh+ati	———	———
	tiṣṭhati	*sthita*	*tasthātha*

The thematic reduplicated verbs do not take Guṇa in any form in the present tense. Past passive participles regularly have no Guṇa. The perfect regularly has Guṇa in the singular.

The following are some examples which show *nā-ni-na* alternations and are handled by the laryngeal.

mthX 'churn'

	3rd. sg. pres.	1st. pl. pres.	3rd. pl pres.
	mthX+ty	mthX+mas	mthX+anty
Break. of Cl.	mathX+ty	mathX+mas	mathX+anty
Guṇa	mathaX+ty	———	———
n-Insert.	mathnaX+ty	mathnX+mas	mathnX+anty
Syl. of Res.	mathnaX+ti	———*	mathnX+anti
Drop. of X/V—	mathnā+ti	———	———
X—→ ī	———	mathnī+mas	———
Drop. of X/—V	———	———	mathnanti
	mathnāti	*mathnimas*	*mathnanti*

*Recall that inserted nasals are exempt from this rule.

	ple.
	mthX+ta
Break. of Cl.	mathX+ta
X—→ i	mathi+tā
	mathita

A nasal verb regularly has a nasal before the Guṇating vowel and the last consonant, or before the last consonant if there is no Guṇating vowel.

The following are some examples which represent *unā ~ uni ~ una ~ ū* alternations :

	3rd. sg. pres.	1st. pl. pres.	3rd. pl. pres.
	pwX+ty	pwX+mas	pwX+anty
Guṇa	pwaX+ty	———	———
n-Insert.	pwnaX+ty	pwnX+mas	pwnX+anty
Syl. of Res.	punaX+ti	punX+mas	punX+anti
Drop. of X/V—	punā+ti	———	———
X—→ i/ī	———	punī+mas	———
Drop. of X/—V	*punāti*	*punimas*	*punanti*

	pple.
	pwX+ta
Syl. of Res.	puX+ta
Drop. of X/V—	pū+ta
	pūta

Note the long vowel, *ū*, in the past participle. Generally, all the forms of the conjugation take the same vowel as the past participle. Vowels in past participles are basic. The length of the pple. vowel is due to the Drop of the Laryngeal.

The following are some examples of overextended roots :

wlynX 'crush'

	3rd. sg. pres.	1st. pl. pres.	3rd. pl. pres.
	wlynX+ty	wlynX+mas	wlynX+anty
Guṇa	wlynaX+ty	———	———
Syl. of Res.	wlinaX+ti	wlinX+mas	wlinX+anti
Drop. of X/V—	wlinā+ti	———	———
X—→ ī	———	wlinī+mas	———
Drop. of X/—V	———	———	wlin+anti
	vlināti	*vlinīmas*	*vlinanti*

	pple.
	wlyX+ta
Syl. of Res.	wliX+ta
Drop. of X/V—	wlī+ta
	vlita

ghrbhx 'seize'

	3rd. sg. pres.	lst. pl. pres.	3rd. pl. pres.
	ghrbhX+ty	ghrbhX+mas	ghrbhX+anty
Guṇa	ghrbhaX+ty	———	———
n-Insert.	ghrbhnaX+ty	ghrbhnX+mas	ghrbhnX+anty
Syl. of Res.	ghr̥bhnaX+ti	ghr̥bhnX+mas	ghr̥bhnX+anti
Drop. of X/V-	ghr̥bhnā+ti	———	———
X—→ ī	———	ghr̥bhnī+mas	———
Drop. of X/-V	———	———	ghr̥bhn+anti
n-Retrofl.	ghr̥bhṇā+ti	ghr̥bhṇī+mas	ghr̥bhṇ+anti
Grassman's Law	gr̥bhṇā+ti	gr̥bhṇī+mas	gr̥bhṇ+anti
	gr̥bhṇāti	*gr̥bhṇīmas*	*gr̥bhṇanti*

	3rd. sg. perf.	pple.
	ghrbhX+a	ghrbhX+ta
Guṇa	ghrabhX+a	————
Redupl.	jha+ghrabhX+a	————
Syl. of Res.	————	ghr̥bhX+ta
X—→ī	————	ghr̥bhī+ta
Drop. of X/-V	jha+ghrabh+a	————
Grassman's Law	ja+grabh+a	gr̥bhī+ta
	jagrabha	*gr̥bhīta*

The forms *vlinimas*, *gr̥bhṇimas* and *gr̥bhīta* have *i* which represents the laryngeal. These forms have a laryngeal between two consonants which, therefore, turns into the vowel *i*; in other forms, it occurs either before or after a vowel. If it is after a vowel, it drops, making the preceding vowel long; for example, *vlīta*, if it is before a vowel, it simply drops. *vlinanti* is an example in which laryngeal drops before the suffix *anti*.

	1st. sg. pres.	1st. pl. pres.
	dwys+my	dwys+mas
Guṇa	dways+my	————
Syl. of Res.	dways+mi	dwis+mas
Mid Vow. Form.	dwes+mi	————
s-Retrofl.	dweṣ+mi	dwiṣ+mas
	dveṣmi	*dviṣmas*

	1st. sg. imperf.	1st. pl. imperf.
	a+dwys+m	a+dwys+ma
Guṇa	a+dways+m	————
Syl. of Res.	————	a+dwis+ma
Mid Vow. Form.	a+dwes+m	————
s-Retrofl.	a+dweṣ+m	a+dwiṣ+ma
m—→ am/C-#	a+dweṣ+am	————
	adveṣam	*adviṣma*

The above examples show that Guṇa occurs in the singular of the present and imperfect, but it does not occur in the plurals. The Guṇated vowel coalesces with the stem vowel *i*, resulting in *e*. Therefore, sing. forms have *e* and plurals have *i*.

Xy 'go'

	lst. sg. pres.	lst. pl. pres.
	Xy+my	Xy+mas
Guṇa	Xay+my	———
Syl. of Res.	Xay+mi	Xi+mas
Drop. of X/-V	ay+mi	i+mas
Mid Vow. Form.	e+mi	———
	emi	*imas*

	lst. sg. imperf.	lst. pl. imperf.
	a+Xy+m	a+Xy+ma
Guṇa	a+Xay+m	———
Drop. of X/V-	———	ā+y+ma
Drop. of X/-V	a+ay+m	———
Like Vow. Coales.	ā+y+m	———
m—→ am/C—#	āy+am	———
Low Vow. Shorten.	———	ay+ma
	āyam	*ayma*

In the sg. of the imperfect, a Guṇa vowel coalesces with the augment, resulting in the long *ā*. In the plural, however, the long *ā* is the result of the dropping of laryngeal with compensatory lengthening of the preceding vowel, which is an augment. If the laryngeal had not been posited, we would have gotten **ema* in the lst. plural imperfect.

Xs 'be'

	3rd. sg. pres.	lst. pl. pres.	3rd. pl. pres.
	Xs+ty	Xs+mas	Xs+anty
Guṇa	Xas+ty	———	———
Syl. of Res.	Xas+ti	———	Xs+anti
Drop. of X/ {-V, #-}	as-+ti	s+mas	s+anti
	asti	*smas*	*santi*

	2nd. sg. imperf.	lst. sg. imperf.	lst. pl. imperf.
	Xs+dhy	a+Xs+m	a+Xs+ma
Guṇa	———	a+Xas+m	———
Syl. of Res.	Xs+dhi	———	———

Drop. of X/V-	———	———	ā+s+ma
X—→ a/#—CC	as+dhi	———	———
Drop. of X/-V	———	a+as+m	———
Like Vow.			
Coales.	———	ās+m	———
Drop. of s	e+dhi	———	———
m—→ am/C—#	———	ās+am	———
	edhi	*āsam*	*āsma*

Note the forms, particularly *āsam* and *āsma*. All the singulars take Guṇa as previously pointed out. The Guṇa vowel and the augment coalesce and produce long *ā* in the lst. sg. imperf. But in the lst. pl. imperf., the augment vowel is lengthened because the laryngeal is dropped. The length of *ā* in *āsma* (lst. pl. imperf.) could not possibly have been accounted for since it does not take Guṇa and the verb root is *Xs*. The verb root cannot be posited as *as* since there exist forms such as *santi* (3rd. pl. pres.), *smas* (lst. pl. pres.), and *sant* (pres. pr.).

	lst. sg. pres.	lst. pl. pres.
	Xd+my	Xd+mas
Guṇa	Xad+my	———
Syl. of Res.	Xad+mi	———
X—→ a/#-CC	———	ad+mas
Drop. of X/-V	ad+mi	———
	admi	*admas*

The vowel *a* in *admi* (lst. sg. pres.) is a Guṇa vowel, but, in *admas*, it represents a laryngeal. The laryngeal becomes *a* before the unpronouncable initial consonant clusters.

	lst. sg. imperf.	lst. pl. imperf.	noun
	a+Xd+m	a+Xd+ma	Xd+ant
Guṇa	a+Xad+m	———	———
Drop. of X/V—	———	ā+d+ma	———
Drop. of X/{—V, #—}	a+ad+m	———	d+ant

Like Vow. Coales.	ādm	———	———
m—→ am/C—#	ādam	———	———
	ādam	*ādma*	*dant*

The explanation of the length of *ā* in these forms is the same as that of *ā* in *āsam* and *āsma*.

Floating Laryngeals :

dyXw 'play'

	3rd. sg. pres.	pple.
	dyXw+ya+ty	dyXw+ta
Syl. of Res.	diXw+ya+ti	dyXu+ta
Float. of Laryng.	———	dyuX+ta
Drop. of X/V—	dīw+ya+ti	dyū+ta
	dīvyati	*dyūta*

In the 3rd. sg. pres., *w* does not become *u* because it is in between two *y*'s. *w* becomes syllabic between two consonants if one of the consonants is an obstruent. The vowel *i* in the 3rd. sg. pres. becomes long due to the compensatory lengthening after the Drop of Laryngeal. In the past participle *dyūta*, long *ū*, is the result of Floating of the Laryngeal and then its drop. Notice, Floating of Laryngeal must precede its drop both before and after a vowel.

daywyX 'goddess'

	nom. sg.	acc. sg.	ins. sg.
	daywyX	daywyX+m	daywyX+ā
Syl. of Res.	daywiX	daywiX+m	———
Float. of Laryng.	———	———	daywy+āX
Drop. of X/V-	daywī	daywī+m	daywy+ā
Mid Vow. Form.	dewī	dewī+m	dewy+ā
	devi	*devim*	*devyā*

	dat. sg.	gen. sg.
	daywyX+ay	daywyX+as
Float. of Laryng.	daywy+aXy	daywy+aXs
Drop. of X/V-	daywy+āy	daywy+ās

Mid Vow. Form.	dewy+āy	dewy+ās
Low Vow. Short.	dewy+ay	———
	devyay	*devyās*

The forms *devyā*, *devyai* and *devyās* show the application of Floating of Laryngeal. If the Floating of Laryngeal is not applied, the form *daywyXay* will become *devye* by the Drop of Laryngeal before Vowel and Mid Vowel Formation. The length of the vowel in the gen. suffix (which is originally *as*) cannot be explained without positing underlying laryngeal.

6. *Restructuring of the Laryngeal in Pāli*

The laryngeal which occurs in the underlying representations of Skt. has been restructured as *i* or *ī* in Pāli. The *i/ī* which reflects the laryngeal sometimes undergoes the major Pāli phonological rule, Mid Vowel Formation. For example :

1. adhi+ṭhi 'stand on' adhiṭṭhema (1st. pl. pres.)
2. ud+ṭhi 'rise' uṭṭhehi (2nd. sg. imperf.)
3. di 'give' deyya (grd.)
4. ni+dhi 'lay down' nidhessāmi (1st. sg. fut.)

Some derivations :

	(1)	adhi+ṭhi+ma
Regular Guṇa		adhi+ṭhai+ma
Mid Vow. Form.		adhi+ṭhe+ma
		adhiṭhema
	(2)	ud+ṭhi+hi
		ud+ṭhai+hi
Regular Guṇa		ud+ṭhe+hi
Mid Vow. Form.		ut+ṭhe+hi
Voic. Assim.		uḍh+ṭhe+hi
Cons. Assim.		uṭ+ṭhe+hi
Cons. Deasp.		*uṭṭhehi*
	(3)	di+ya
		dai+ya
Regular Guṇa		dai+yya
y-Gemination		de+yya
Mid Vow. Form.		*deyya*

	(4)	ni+dhi+sy+a+mi
Regular Guṇa		ni+dhai+sy+a+mi
Theme Vow. Length.		ni+dhai+sy+ā+mi
Mid Vow. Form.		ni+dhe+sy+ā+mi
y-Assim.		ni+dhe+ss+ā+mi
Vow. Short. Bef. Cons.		ni+dhĕ+ss+ā+mi
		nidhĕssāmi

In most cases, however, the restructuring of laryngeals to *i/i* has left a minor rule, Laryngeal Coalescence. For example :

1.	di	'give'	dadāti	(3rd. sg. pres.)
			dinna	(pple.)
2.	ṭṭhi	'stand'	aṭṭhāsi	(3rd. sg. aor)

	(1)	di+a+ti	di+na
Regular Guṇa		dai+a+ti	———
Redupl.		da+dai+a+ti	di+d+na
Laryng. Coales.		da+dā+a+ti	———
Like Vow. Coales.		da+dā+ti	———
Cons. Assim.		———	di+n+na
		dadāti	*dinna*

	(2)	a+ṭṭhi+si	ṭṭhi+ta
Gem. Red.		———	ṭhi+ta
Regular Guṇa		a+ṭṭhai+si	———
Laryng. Coales.		a+ṭṭha+si	———
		aṭṭhasi	*ṭhita*

The alternations such as *nā~ni~n~ϕ~i* are found in Skt. All of these could be handled by the laryngeal and the n-Insertion rule. In Pāli, parts of the alternations were lost. Only the *nā~ϕ~i* alternations are left. *nā* was reinterpreted as a suffix if it occurred uniformally through the present system and no where else. This left only a *ϕ~i* alternation, which could best be handled by the Seṭ *i* Insertion rule. For example, compare the following derivations of Pāli *gaṇhāti/gahita* with their original, or Skt., derivations.

Skt.	3rd. sg. pres.	pple.
	grjhX+ti	grjhX+ta

Guṇa	grjhaX+ti	— — —
n-Insert.	grjhnaX+ti	— — —
n-Retrofl.	grjhṇaX+ti	— — —
Drop. of X/V-	grjhṇā+ti	— — —
Syl. of Res.	gr̥jhṇā+ti	gr̥jhX+ta
X⟶ ī	———	gr̥jhī+ta
Weak. of Vcd. Asp.	gr̥hṇā+ti	gr̥hī+ta
	grhṇāti	*grhita*

Pāli

	grjh+nā+ti	grjh+ta
Set. Insert.	———	grjhi+ta
n-Retrofl.	grjh+ṇā+ti	— — —
Syl. of Res.	gr̥jh+ṇā+ti	gr̥jhi+ta
Fate of Syl. Res.	gajh+ṇā+ti	gajhi+ta
Weak. of Vcd. Asp.	gah+ṇā+tt	gahi+ta
Metathesis	gaṇ+hā+ti	— — —
	gaṇhāti	*gahita*

The laryngeal has also left another minor rule, Vowel Lengthening, in the verb *jāyati* 'is born'. However, this rule has been merged with the general rule, Vowel Lengthening in passive. Compare the derivation of Pāli *jāyati* with its Skt. derivation :

Skt.

	jnX+y+a+ti
Syl. of Res.	jn̥X+y+a+ti
Fate of Syl. Res.	jaX+y+a+ti
Drop. of X/V—	jā+y+a+ti
	jāyati

Pāli

	jn+y+a+ti
Syl. of Res.	jn̥+y+a+ti
Fate of Syl. Res.	ja+y+a+ti
Vow. Length. in √jn	jā+y+a+ti
	jāyati

Thus, the Skt. laryngeal has been restructured as $\overset{\circ}{i}$ which undergoes either Mid Vowel Formation or Laryngeal Coalescence. In some cases, however, it has been lost, leaving the Seṭ *i* Insertion rule behind. The minor rule, Vowel Lengthening, in the verb *jāyati*, which was the result of the loss of laryngeal, has been merged with the rule Vowel Lengthening in Passive. Most of the alternations which required the laryngeal in the underlying representations have been lost. The remaining few alternations can be handled by minor rules. Hence, there is no need to posit the laryngeal in the underlying representations of Pāli.

II. *Changes in Skt. Rules*

A set of ordered rules and a global constraint are required for the description of Pāli Phonology. A set consists of 50 Phonological rules and 11 readjustment rules. Out of 50 Phonological rules, 27 are Pāli rules. Pāli has inherited the rest of the phonological rules from Skt. Out of 11 readjustment rules, 5 are Pāli innovations, and the rest are carried over from Skt.

Phonological Rules :

(1) Inherited rules:

(1) Reversion of Palatals
(2) Drop of s with Compensatory Lengthening
(3) Retroflexion : (a) s-Retroflexion (b) n-Retroflexion
(4) s-Dissimilation
(5) Syllabification of Resonants
(6) Unnatural Sandhi Generalization
(7) Long High Vowel Separation
(8) Like Vowel Coalescence
(9) Glide Formation
(10) Weakening of Voiced Aspirates
(11) Progressive Palatalization of Nasals
(12) Mid Vowel Formation
(13) Prefix Vowel Nasalization
(14) Bartholomea's Law

(15) Voicing Assimilation
(16) Sibilization of Retroflex Stops
(17) Retroflex Assimilation
(18) Retroflex Lateralization
(19) Liquid Dropping
(20) Vowel Nasalization
(21) Nasal Assimilation
(22) Gemination of Palatal Affricates
(23) Consonant Deaspiration

(2) Pāli innovations:

(1) Fate of Syllabic Resonants
(2) Vowel Lengthening in plurals
(3) y-Gemination
(4) Coalescence of Gl. with Vowels
(5) The Drop of Intervocalic w
(6) Assimilation of Front Consonants
(7) Nasal Assimilation to Liquids
(8) Dropping of Final Consonants
(9) s-Softening
(10) Metathesis
(11) i-Insertion Between r and y
(12) Palatalization
(13) y-Assimilation
(14) r-Assimilation
(15) w-Assimilation
(16) Fricativization of w
(17). Palatalization of Affricates
(18) Shortening of Nasalized Vowels
(19) Progressive Nasal Assimilation
(20) h-Assimilation
(21) Consonant Assimilation
(22) Occlusivization of Geminate Fricatives
(23) Reduction of Geminate v
(24) Burma Occlusivization
(25) Reduction of Geminate h
(26) Vowel Shortening Before Two Consonants
(27) Deretroflexion and Depalatalization of s

Readjustment Rules :

(1) Inherited rules :

(1) Guṇa and Vṛddhi : (a) Regular Guṇa and Vṛddhi (b) Samprasāraṇa Guṇa and Vṛddhi
(2) Drop of Nasals and Liquids in Nom. sg.
(3) Reduplication
(4) Theme Vowel Lengthening
(5) s-Simplification
(6) n-Insertion

(2) Pāli innovations :

(1) Glide Insertion
(2) Vowel Lengthening in Passive
(3) Laryngeal Coalescence
(4) Svarabhakti
(5) Set *i* Insertion

Mostly, Pāli has kept the inherited rules in the same form as they were in Skt. However, some inherited rules have been generalized, and a few have been particularized. Some Pāli innovations, which seem to be related to some of the minor rules of Skt., have obtained the status of major rules in Pāli. In this sense, they are generalized rules. The rules (inherited as well as innovated), which have been generalized, are : n-Insertion, s-Retroflexion, Vowel Lengthening in Plurals, Unnatural Sandhi Generalization, Nasal Assimilation to Liquids, Dropping of Final Consonants, Vowel Nasalization, Palatalization, and Vowel Shortening Before Two Consonants. Only one rule, Prefix Vowel Nasalization, has been particularized. In this section, the forms of these rules, both in Skt. and Pāli, their comparison, and the manner in which Pāli rules are generalized will be discussed.

Generalized Rules :

1. *n-Insertion*

In both Skt. and Pāli, when an oblique case suffix starts

with a vowel and if the stem ends in a nonnasal resonant, *n* is inserted between the stem and a suffix.

$$\phi \text{---} \begin{bmatrix} +\text{cns} \\ +\text{nas} \end{bmatrix} \quad / \quad \begin{bmatrix} +\text{res} \\ -\text{nas} \end{bmatrix} \text{---} \begin{bmatrix} \text{V} \end{bmatrix}$$

STEM — Oblique case suffix

(1) Skt. *n* insertion was optional for *i* and *u* stems in weak cases; for example, *paśvā*, *madhvā*, etc.

(2) It was obligatory in the gen. pl. of *i*, *u* and *r* stems.

(3) In the sg. of *i* and *u* stems, it was more common in neuters than in any other gender.

(4) In Skt., this rule serves the same function as that of the inserted *n* in the nasal infix verbs. *n* is inserted to avoid the sequence consonant plus glide.

This rule has been generalized in Pāli for the following reasons:

(1) It is obligatory for *i* and *u* stems.

(2) It is optional for *r* stems. It did not apply to *r* stems in Skt.

except in gen. pl.

Examples :

Skt.

(1) ali+ā—→ alinā (mas. inst. sg.)

(2) paśu+ā—→ paśunā (mas. inst. sg.)

(3) paśu+ā—→ paśvā (mas. inst. sg.)

(4) madhu+ā—→ madhvā (mas. inst. sg.)

(5) vadhū+ām—→ vadhūnām (fem. gen. pl.)

(6) dātr+ām—→ dātṛṇām (mas. gen pl.)

(7) vāri+i—→ vāriṇi (neut. loc. sg.)

(8) madhu+ai—→ madhune (neut. dat. sg.)

(9) vāri+as—→ vāriṇas (neut. gen. sg.)

Pāli

(1) aggi+ā—→ agginā (mas. inst. sg.)
(2) bhikkhu+ā—→ bhikkhunā (mas. inst. sg.)
(3) akkhi+o—→ akkhino (neut. gen. sg.)
(4) nadi+am—→ nadīnaṃ[1] (fem. gen. pl.)
(5) pitr+o—→ pituṇo[2] (mas. gen. sg.)

2. *s-Retroflexion*

All alveolar *s*'s become retroflex after *r*, *u*, *k* and *i*.

Skt.

$$\begin{bmatrix} +\text{obs} \\ +\text{cnt} \\ +\text{str} \end{bmatrix} \longrightarrow [+\text{flt}] \; / \; \left\{ \begin{bmatrix} -\text{obs} \\ -\text{nas} \\ +\text{cnt} \\ +\text{res} \end{bmatrix}, \begin{bmatrix} +\text{obs} \\ +\text{grv} \\ +\text{high} \end{bmatrix} \right\} —$$

Pāli

$$\begin{bmatrix} +\text{obs} \\ +\text{cnt} \\ +\text{str} \end{bmatrix} \longrightarrow [+\text{flt}] \; / \begin{bmatrix} -\text{obs} \\ -\text{nas} \\ +\text{cnt} \\ +\text{res} \end{bmatrix} —$$

Examples :

Skt.

(1) iṣ+ta (pple.) 'desired'
s-Retrofl. iṣ+ta
Retrofl. Assim. iṣ+ṭa
iṣṭa

(2) sthā/tiṣṭhati 'stand'
sthi+a+ti
Redupl. ti+sth+a+ti
s-Retrofl. ti+ṣth+a+ti
Retrofl. Assim. ti+ṣṭh+a+ti
tiṣṭhati

[1] ī by vowel lengthening in plurals.
[2] *ṇ* by n retroflexion (caused by underlying *r*).

(3) dhenu+su (f. loc. pl.)
'cow'
s-Retrofl. dhenu+ṣu
dhenuṣu

(4) krs+ta (pple.) 'ploughed'
s-Retrofl. krṣ+ta
Syl. of Res. kr̥ṣ+ta
Retrofl. Assim. kr̥ṣ+ṭa
kr̥ṣṭa

(5) sraj+su (mas. loc. pl.)
'garland'
Reversion of Pal.—A s-Retrofl. srak+su
srak+ṣu
srakṣu

Pāli

Examples :

(1) is+ta (pple.) 'desired'
s-Retrofl. iṣ+ta
Retrofl. Assim. iṣ+ṭa
s-Soften. ih+ṭa
Metathesis iṭ+ha
h-Assim. iṭ+ṭha
iṭṭha

(2) dhenu+su (f. loc. pl.)
'cow'
s-Retrofl. dhenu+ṣu
Deretrofl. of s dhenu+su
dhenusu

(3) krs+ta (pple.) 'ploughed'
s-Retrofl. krṣ+ta
Syl. of Res. kr̥ṣ+ta
Fate of Syl. Res. kaṣ+ta
Retrofl. Assim. kaṣ+ṭa
s-Soften. kah+ṭa
Metathesis kaṭ+ha
h-Assim. kaṭ+ṭha
kaṭṭha

Nearly all the occurrences of *ṣ* are predictable in Skt. with one exception, the numeral *ṣaṣ*, 'six'. Retroflex *ṣ* occurs after *i*, *u*, *r* or *k*; and *s* does not occur in this environment. For example,

akṣ	'attain'	bharts	'revile'
kuṣ	'tear'	kas	'open'
bhūṣ	'adorn'	bhās	'shine'
dwiṣ	'hate'	was	'clothe, dwell'

The segments that cause retroflexion of *s* to *ṣ* have been specified by Zwicky (1965, p. 58) as $\begin{bmatrix} \alpha\text{cons} \\ \alpha\text{comp} \end{bmatrix}$. This class includes the vowels *i* and *u*, the glides *y* and *w*, the liquid, *r*, and all velar and palatal consonants. Most of the occurrences of *ṣ* are predicted by the rule. Other occurrences result from an assimilation of Retroflexion rule. However, there are some exceptions which will have to be marked as not being subject to s-Retroflexion rule. The locative singular suffix has been treated by Zwicky as being preceded by a word boundary.

To account for the forms such as *havissu* (from *haw+is* 'sacrifice', actually from the verbal root *hu* 'sacrifice) and *caksuṣsu* (from *caks+us* 'eye' ultimately from *caks* 'notice') as opposed to *dviṭsu* (by s-Dissimilation rule from *dvis+su* 'hate'), Zwicky allows s-Retroflexion rule to apply across an intervening spirant. He has stated the rule in the following way :

$$\begin{bmatrix} +\text{obs} \\ +\text{cnt} \\ -\text{comp} \end{bmatrix} \longleftarrow \begin{bmatrix} +\text{comp} \\ +\text{fl} \end{bmatrix} \Big/ \begin{bmatrix} \alpha\text{cons} \\ \alpha\text{comp} \end{bmatrix} \left(\begin{bmatrix} +\text{obs} \\ +\text{cnt} \end{bmatrix}\right)(\#)-$$

This rule applies across # as well as +.

There are several problems with Zwicky's rule. Zwicky calls retroflexes (+cmp). He apparently thinks that the sequence retroflex plus *s* will not be affected because (1) *s*'s which become retroflex after retroflex have already been handled by Retroflex Assimilation rule, and (2) the prefix *su*, whose *s* does not become retroflex after retroflex, is preceded by a word boundary. But s-Retroflexion has to be allowed to apply across a word boundary since *vac+su*⟶*vak+su* by reversion of palatals, and

vak+*ṣu* by s-Retroflexion, caused by preceding *k*. Thus Zwicky's rule will Convert *sam*+*rāj* # *su* to *sam*+*rāṭ* # *ṣu*. He cannot be saved by rule order as the following derivations show :

	sam+rāj# su(mas. loc.sg.)
Rev. of Pal.-B	sam+rāḍ # su
Voice Assim.	sam+rāṭ # su
s-Retrofl.	sam+rāṭ # ṣu
	**samrāṭṣu*
	sam+rāj # su
Rev. of Pal.-B	sam+rāḍ # su
s-Retrofl.	sam+rāḍ # ṣu
Voice Assim.	sam+rāṭ # ṣu
	**samrāṭṣu*
	sam+rāj # su
s-Retrofl.	sam+rāj # ṣu
Rev. of Pal.-B	sam+rāḍ # ṣu
Voice Assim.	sam+rāṭ # ṣu
	**samrāṭṣu*

Since the incorrect forms are due to Zwicky's questionable decision to consider retroflexes compact, we might conceivably propose considering them diffuse instead. But this suggestion would mess up Zwicky's s-Retroflexion rule in another way. Since *r* is [+consonantal], it must also be [+cmp] to cause s-Retro-flexion. Thus, Zwicky decided that Saṃskrit *r* was retroflex like English rather than alveolar flap as in mondern Indic languages. We cannot quarrel with this decision since it receives support from Pāṇini. Zwicky had to decide further that retroflexes were compact in order to allow *r* to trigger s-Retroflexion.

Even if zwicky's rule worked, it would be objectionable. $\begin{bmatrix} \alpha\text{cons} \\ \alpha\text{cmp} \end{bmatrix}$ do not form a natural class. Restrictions need to be placed on αC's. αC's can be placed in front of features which are related, in the sense of Jakobson, Fant & Halle's (1967) feature system, such as, before the primary resonance feature or tonality

feature. Thus $\begin{bmatrix} \alpha\text{cons} \\ \alpha\text{voc} \end{bmatrix}$ and $\begin{bmatrix} \alpha\text{grv} \\ \alpha\text{flt} \end{bmatrix}$ are allowed, but not $\begin{bmatrix} \alpha\text{cns} \\ \alpha\text{flt} \end{bmatrix}$ or $\begin{bmatrix} \alpha\text{voc} \\ \alpha\text{cmp} \end{bmatrix}$.

There are exceptions which occur after *i*, *u*, and *r*, but not after *k*. This is the evidence which indicates that the rule should be divided into two sub-rules. The important point is that the two sub-rules are statable in terms of two natural classes, whereas Zwicky's one rule is not governed by the naturalness condition. *r*, *u* and *i* are characterized by moderately high sonority, higher than *m*, *n*, and *l* and lower than *a*. But *k* is a sound of low sonority and is not properly grouped with *r*, *u* and *i*.

Pāli has the first sub-rule of this Skt. rule. The Pāli rule is a natural rule. But, we cannot be absolutely sure that this fact is due to the search for naturalness. The fact that *s* is not retroflected after *k* is the result of historical accident. *Stop+ sibilant* changed to geminate aspirate stop regardless of the nature of sibilant.

3. *Vowel Lengthening in Plurals*

In Skt., the last vowel of a noun stem in the accusative and genitive plural is lengthened. In Pāli, the last vowel of a noun stem in the plural is long if the suffix begins with a consonant.

$$V \longrightarrow [+\text{lng}] \,/\, \text{——}]$$

Skt.

$$+\text{noun stem}$$
$$+\text{plural}$$
$$\begin{Bmatrix} +\text{gen.} \\ +\text{acc.} \end{Bmatrix}$$

$$V \longrightarrow [+\text{lng}] \,/\, \text{——}] \; C$$

Pāli

$$\begin{bmatrix} \text{noun stem} \\ +\text{plural} \end{bmatrix}$$

Stem Vowel Lengthening was limited only to acc. and gen. plurals in Skt. In Pāli, Vowel Lengthening took place in all plurals. Thus the rule has been generalized.

Some derivations :

Skt.

(1) agni+ns (m. acc. pl)		agni+ām (m. gen. pl.)
n-Insert.	.....	agni+nām
Vow. Length. in Pl.	agnī+ns	agnī+nām
Cluster Simpl.	agnī+n	.....
	agnīn	*agnīnām*
(2) paśu+ns (m. acc. pl)		paśu+ām (m. gen. pl.)
n-Insert.	.....	paśu+nām
Vow. Length. in Pl.	paśū+ns	paśū+nām
Final Cluster Simpl.	paśū+n	.....
	paśūn	*paśūnām*

Pāli

(1) aggi+ϕ (m. nom. pl.)		aggi+ām (m. gen. pl)
n-Insert.	.....	aggi+nām
Vow. Length. in Pl.	aggī	aggī+nām
	aggi	*agginām*
(2) dhenu+bhi(f. inst. pl.)		dhenu+su(f. loc. pl.)
Vow. Length. in Pl.	dhenū+bhi	dhenū+su
s-Retrofl.	.....	dhenū+ṣu
Deretrofl. of *s*	.....	dhenū+su
	dhenūbhi	*dhenūsu*

4. *Unnatural Sandhi Generalization*

There exists an external Sandhi rule in Skt. which states that word final *as* becomes *o* before another word which begins with the vowel *a* or a voiced consonant. The Pāli rule, however, states that word final *as* becomes *o* everywhere.

Skt.

$$\begin{bmatrix} -\text{cns} \\ +\text{syl} \\ -\text{lng} \\ +\text{low} \end{bmatrix} \begin{bmatrix} +\text{obs} \\ +\text{cnt} \\ +\text{str} \end{bmatrix} \not\# \left\{ \begin{bmatrix} -\text{cns} \\ +\text{syl} \\ +\text{low} \\ -\text{lng} \end{bmatrix} \begin{bmatrix} +\text{cns} \\ +\text{vcd} \end{bmatrix} \right\}$$

SD :	1	2	3	4
SC :	1	ϕ	3	4

$$\begin{bmatrix} +\text{lng} \\ -\text{low} \\ -\text{high} \end{bmatrix}$$

Pāli

$$\begin{bmatrix} -\text{cns} \\ +\text{syl} \\ -\text{lng} \\ +\text{low} \end{bmatrix} \quad \begin{bmatrix} +\text{obs} \\ +\text{cnt} \\ +\text{str} \end{bmatrix} \quad \#$$

SD :	1	2	3
SC :	1	ϕ	3

$$\begin{bmatrix} +\text{lng} \\ -\text{low} \\ -\text{high} \end{bmatrix}$$

The rule in Skt. is very strange. The form of the rule and the environment in which the rule is applicable are both very unnatural. There is nothing in the environment which should cause *a* to become rounded. Besides, *a* and voiced consonants do not form a natural class to the exclusion of other voiced sounds.

The Pāli rule is a bit more natural than the Skt. rule. Even though the form of the rule is the same, the environment is changed. Word boundary, as an environment for a rule, is more natural than the class of *a* and voiced consonants. The Pāli rule is more natural and thus more general. The feature system reflects this fact. It contains 6 features less than the Skt. rule. Every *as* # becomes *o* in Pāli.

Examples : *Skt.*

(1) So 'pi 'he also'
(2) devo gacchati 'a god is going'
(3) devo 'api 'also a god'; devaḥ 'god'
(4) devas tatra 'a god there'
(5) manas 'mind'; manasā (inst. sg.)

Some derivations :

(1) devas gacch+a+ ti 'a god is going'

Unnatural Sandhi General. devo gacchati

devo gacchati

(2) sas api 'he also'

Unnatural Sandhi General. so api

Elision of a so 'pi

so 'pi

Pāli

(1) manas 'mind'/manasā inst sg.

(2) mano tatra 'mind is there'

Some derivations :

manas (n. nom. sg.) manas tatra

Unnatural Sandhi General. mano mano tatra

mano *mano tatra*

5. *Nasal Assimilation to Liquids*

The Skt. rule states that, when a nasal precedes an *l*, it assimilates to it but keeps its nasalization. The assimilation is partial, and, therefore, the rule can be called Lateralization of Nasals. In Pāli, a nasal consonant assimilates not only to *l* but also to *r*, and the assimilation is complete.

Skt.

$$\begin{bmatrix} +\text{cns} \\ +\text{nas} \end{bmatrix} \qquad \begin{bmatrix} +\text{cns} \\ -\text{obs} \\ -\text{nas} \\ -\text{cnt} \end{bmatrix}$$

SD : 1 2

SC : 2 2

[+nas]

Pāli

$$\begin{bmatrix} +\text{cns} \\ +\text{nas} \end{bmatrix} \qquad \begin{bmatrix} +\text{cns} \\ -\text{obs} \\ -\text{nas} \end{bmatrix}$$

2

SD : 1 2

SC : 2

The Pāli rule is more general for two reasons : (1) it applies to a larger class, and (2) it does not create an unnatural segment.

Examples:

	Skt.
	sam+lap+a+ti 'converses'
Nas. Assim. to Liquid	sal+lap+a+ti
	sallapati
	Pāli
	(1) sam+lap+a+ti
Nas. Assim. to Liquid	sal+l̃ap+a+ti
	s̃allapati
	(2) sam+rāga
Nasal Assim. to Liquid	sar+rāga
Drop. of Liquid	sā+rāga
	sārāga

6. *Dropping of Final Consonant*

In Skt., a word final consonant is dropped only when preceded by another consonant. Therefore, the Consonant Dropping rule is really a cluster simplification rule of Skt.

$$C \longrightarrow \phi \,/\, C \;_\; \#$$

In Pāli, every non-nasal, word final consonant drops.

$$C \longrightarrow \phi \,/\, _\; \#$$

$$[-\text{nas}]$$

Obviously, the Pāli rule is more general than the Skt. rule. Examples :

Skt.

(1) marut+s ⟶ *marut* 'wind' (m. nom. sg.)
(2) vāc+s ⟶ vāk+s ⟶ *vāk* 'voice' (f. nom. sg.)
but marut+am ⟶ *marutam* (m. acc. sg.)
vāc+am ⟶ *vācam* (f. acc. sg.)

Pāli

(1) viharant+ ϕ ⟶ *viharaṃ* (nom. sg. ppr.)
but viharant + am ⟶ *viharantaṃ* (acc. sg. ppr.)

7. *Vowel Nasalization*

In Skt., a vowel is nasalized when followed by a nasal consonant which is immediately followed by a sibilant or *h*. In Pāli, a vowel is nasalized in the environment mentioned for the Skt. rule plus the word boundary.

Skt.

$$V \quad N \quad \left\{ \begin{bmatrix} +\text{obs} \\ +\text{cnt} \end{bmatrix} \right\} \quad \left\{ \begin{bmatrix} -\text{cns} \\ -\text{syl} \\ -\text{high} \end{bmatrix} \right\} \quad \#$$

SD : 1 2 3
SC : 1 3
[+nas]

Examples and their derivations :

Skt.

Vowel Nas. (1) han+si 'you kill'
haṃ+si
haṃsi

Vowel Nas. (2) sinha 'lion'
siṃha
siṃha

Pāli

Vowel Nas. (1) dhamma+m 'duty' (m. acc. sg.)
dhamma+ṃ
dhammam

n-Insert. (2) aggi+am
aggi+nam

Vowel Length. in Pl.	aggī+nam	
Vowel Nas.	aggī+naṃ	
	agginaṃ	
	(3) hansati 'bristles'	haṭṭha (pple.)
	hrs+a+ti	hrs+ta
n-Insert.	hrns+a+ti	———
s-Retrofl.	hrnṣ+a+ti	hrṣ+ta
n-Retrofl.	hrṇṣ+a+ti	———
Syl. of Res.	hrṇṣ+a+ti	hrṣ+ta
	°	°
Fate of Syl. Res.	haṇṣ+a+ti	haṣ+ta
Retrofl. Assim.	———	haṣ+ṭa
Vowel Nas.	haṃs+a+ti	———
s-Soften.	———	hah+ṭa
Metathesis	———	haṭ+ha
h-Assim.	———	haṭ+ṭha
	haṃsati	*haṭṭha*

The Pāli rule can be viewed as being particularized. The Skt. rule is quite natural ; the environment includes two segments *s* and *h* which form a natural class. The Pāli rule, however, contains one extra feature, word boundary. Word boundary and consonants form a natural class. The evidence is that both # and consonants end a syllable. However, *s*, *h* and # do not form a natural class. Word boundary acts more like a stop than a fricative.

In Pāli, the Vowel Nasalization rule and the Dropping of Final Consonants conspire. The rule Consonant Dropping drops word final nonnasal consonants, and the Pāli Nasalization rule, among other things, drops word final nasal consonants. The affect of the two rules together is to exclude all word final consonants, while allowing some deleted consonants to be recovered. It should be noted that as # ⟶ o (Unnatural Sandhi Generalization) also takes part in this conspiracy.

In both the Skt. and Pāli rule, *h* is treated as a glide. In generative phonology, *h* is usually considered to be a glide for several reasons. (1) Practical reason : Jakobson's feature system uses the features diffuse and compact. According to

this system, *h* and velar consonants will be [+compact] and [+grave]. They need to be distinguished by some other feature. Thus, they are distinguished by the feature consonantal. *h* is treated as [—cons].

If we use the features high and low, instead of diffuse and compact, *h* has to be distinguished from the labial fricatives *f*, *v*, *ɸ* and *β*. Since both *h* and labial fricatives are [—high], [+cnt] and [+grv], *h* needs to be considered as a glide.

(2) Articulatory reason : [+cns] segments involve oral contact. There is no oral contact in the production of *h*. Therefore, it is considered as [—cns].

However, *h* needs to be considered a fricative, especially for the following reasons : (i) *h* does not alternate with vowels as other glides do; and (ii) most often it acts as a fricative, for example : (a) in Pāli, a vowel is nasalized before *s* and *h*; (b) *s*——→*h* not only in Pāli but also in many other languages; and (c) *f* historically changed to *h* in Spanish.

8. *Palatalization*

Skt. Palatalization rule was limited to voiced stops. The obstruents *dh* and *d* became palatalized before the glide *y*. In Pāli, it has become general. It not only applies to voiced stops but to voiceless stops and nasals as well.

$$\textit{Skt.}\quad \begin{bmatrix} +\text{obs} \\ -\text{grv} \\ -\text{cnt} \\ +\text{vcd} \\ -\text{flt} \end{bmatrix} \longrightarrow [+\text{high}] \;/\; __ \begin{bmatrix} -\text{cns} \\ -\text{syl} \\ +\text{high} \\ -\text{grv} \end{bmatrix}$$

$$\textit{Pāli}\quad \begin{bmatrix} \left\{ \begin{matrix} +\text{obs} \\ +\text{nas} \end{matrix} \right\} \\ -\text{grv} \\ -\text{cnt} \end{bmatrix} \longrightarrow \begin{bmatrix} +\text{high} \\ -\text{flt} \end{bmatrix} \;/\; __ \begin{bmatrix} -\text{cns} \\ -\text{syl} \\ +\text{high} \\ -\text{grv} \end{bmatrix}$$

Even though the Pāli rule is more general than the Skt. rule in its application, the feature system used for the description of Pāli, which is close to McCawley's system, does not reflect this generalization. Jakobson's feature system, however, does a

good job of expressing this generalization. Consider the above rules in terms of Jakobsonian features :

Skt.

$$\begin{bmatrix} +\text{cns} \\ -\text{voc} \\ -\text{nas} \\ -\text{grv} \\ -\text{cnt} \\ +\text{vcd} \end{bmatrix} \Longrightarrow [-\text{dif}] \; / \; \text{——} \; \begin{bmatrix} -\text{cns} \\ -\text{voc} \\ +\text{dif} \\ -\text{grv} \end{bmatrix}$$

Pāli

$$\begin{bmatrix} +\text{cns} \\ -\text{voc} \\ -\text{grv} \\ -\text{cnt} \end{bmatrix} \Longrightarrow [-\text{dif}] \; / \; \text{——} \; \begin{bmatrix} -\text{cns} \\ -\text{voc} \\ +\text{dif} \\ -\text{grv} \end{bmatrix}$$

Jakobson's feature system uses 9 features to state the Pāli rule as opposed to the Skt. rule which contains 11 features. In the Jakobsonian feature system, obstruents and nasals form a natural class to the exclusion of liquids. They don't form a natural class in McCawley's feature system.

Examples:

	Skt	
	jyotati/dīvyati	'shines'
	dyXw+t+a+ti	dyXw+y+a+ti
Regular Guṇa	dyXaw+t+a+ti	.....
Syl. of Res.	.....	diXw+y+a+ti
Laryng. Drop/V–	.....	dīw+y+a+ti
Laryng. Drop/–V	dyaw+t+a+ti	.....
Mid Vowel Form.	dyo+t+a+ti	.....
Palataliz.	jyo+t+a+ti	.....
	jyotati	*divyati*

Pāli

(1) budh 'know' bujjhati 'to be enlightened'
(2) vad 'speak' vajjati 'is spoken'
(3) han 'kill' haññati 'is killed'
(4) eti 'goes' acceti 'elapses'
(5) odaka 'water' accodaka 'too much water'

Following are some derivations :

	vad+y+a+ti	han+y+a+ti
Palataliz.	vaj+y+a+ti	hañ+y+a+ti
y-Assim.	vaj+j+a+ti	hañ+ñ+a+ti
	vajjati	*haññati*
	ati+eti	ati+odaka
Glide Form.	aty+eti	aty+odaka
Palataliz.	acy+eti	acy+odaka
y-Assim.	acc+eti	acc+odaka
	acceti	*accodaka*

Sometimes nasals behave like obstruents; for example, both nasals and obstruents undergo Palatalization in Pāli. In morpheme structure rules, nasals following initial obstruents are very unnatural, whereas initial obstruents plus liquid is the most natural consonant cluster.

McCawley's system accounts for syllabic nasals and liquids; Jakobson's can't. [+voc] is not a natural class. Vowels and liquids do not form a natural class to the exclusion of glides.

9. *Vowel Shortening Before Two Consonants*

Skt. *a* is lengthened before CV in causatives.

$$a \longrightarrow \bar{a} \;/\; __ \; CV]$$

Causative

This is because the vowel found in causatives in IE. was *o*. The process produced *a*/*ā* alternations in Skt. These alternations were generalized and the rule vowel shortening resulted in Pāli.

$$V \longrightarrow [-\text{lng}] \;/\; __ \; CC$$

This rule is extremely natural and occurs in quite a few languages. It may be the case that this rule took place in Pāli spontaneously and has no relationship with the above mentioned Skt. process.

Particularized Rules:

Prefix Vowel Nasalization

A final nasal consonant of a prefix, when followed by a root

which begins with *y*, *r*, *w*, or *l*, drops with compensatory nasalization. The rule is as follows :

$$\text{VN}] \quad \underset{\text{Root}}{\overset{\text{Prefix}}{\quad}} \quad \begin{bmatrix} -\text{obs} \\ -\text{syl} \end{bmatrix}$$

SD : 1 2 3
SC : 1 3
[+nas]

Skt. also has a Vowel Nasalization rule which applies only across word boundaries. The nasal consonant *m* becomes *anusvāra* before glides and liquids. The Skt. rule is as follows :

$$\text{Vm} \quad \# \quad \begin{bmatrix} -\text{obs} \\ -\text{sy} \end{bmatrix}$$

SD : 1 2 3 4
SC : 1 3 4
[+nas]

In Pāli, the rule is needed because of the peculiar treatment of *sam*. *sam* is the only prefix containing the final nasal consonant whose nasal undergoes the Vowel Nasalization rule. In Skt., *sam* was a separate word and handled by general external Sandhi rule. Since *sam* has become a prefix, losing its independent existence, the external Sandhi rule of Skt. remained in Pāli in the form of Prefix Nasalization. Thus, the rule has become particularized in Pāli.

Examples :

Skt.

(1) sam+vatsara ⟶ saṃvatsara 'year'
(2) sam+yama ⟶ saṃyama 'restraint'
(3) sam+yata ⟶ saṃyata 'controlled'

Pāli

(1) sam+yamati ⟶ saṃyamati 'practices'

CHAPTER V

SUMMARY AND CONCLUSION

In the first chapter, the purpose and the scope of this work was briefly outlined. The origin of the Pāli language and the feature system used in this work was discussed. Further, a global constraint, which reduces geminates in unnatural positions, was suggested.

The second chapter dealt with the phonological description of Pāli. Rules were written in terms of McCawley's feature system which is a revision of the Jakobson and Halle's (1956) feature system used in *Fundamentals of Language*. However, some of McCawley's features which are of limited applicability were excluded. The order of phonological rules as well as that of Readjustment rules was discussed. Rules in each set were ordered with respect to each other as well as with respect to the rules in the other set. Current linguistic theory states that any readjustment rule precedes all other phonological rules. However, it was found that the Pāli rule—Vowel Lengthening in Plurals—formally a readjustment rule referring to the syntactic environment, is both preceded and followed by other phonological rules. Thus the behaviour of Vowel Lengthening in Plurals in Pāli seems to go against the theoretical principle.

The third chapter was devoted to pointing out the distinction between those sound changes which are historical processes and those which are synchronic phonological rules. It was shown that some sound changes which seem to be synchronic rules are only historical processes which resulted in restructuring and left no traces in the grammar. l-Assimilation is such a historical process. It was also shown that there are some sound changes which seem to be historical processes which are actually synchronic rules. The sound change Skt. (ś/ṣ)⟶ Pāli *s* is reflected in the form of the synchronic rule, Depalatalization and Deretroflexion. Pāli has inherited some rules from Skt. and innovated some of its own. The order of these innovations, or synchronic rules, has been discussed in the light

of the diachronic order, or the order of rules which have been inherited from Skt. The rules which Pāli and Skt. share are usually found in the same order in the two languages. Occasionally, however, it seems that two Skt. rules have been ordered or that a Pāli rule has been inserted ahead of a Skt. rule. In the discussion of the order of Mid Vowel Formation—both Pāli and Skt. rule—with respect to the Drop of intervocalic w—a Pāli rule—three explanations : generalization, reordering and addition of a new rule was proposed. But the last one was claimed to be the most adequate one. The ordering of Pāli Mid Vowel Formation was compared with the ordering of Vowel shortening. It was pointed out that the former one was added at the end of the phonological component whereas the latter one was added before Vowel Nasalization, which is a low level phonetic rule.

The fourth chapter was devoted to a comparison of Pāli and Skt. phonologies. The nature of the underlying forms in Pāli and Skt. was discussed. As was pointed out, the underlying forms of Skt. verbal roots are of an unnatural nature. Whereas, in Pāli, they are more natural. In Pāli, many roots begin with initial geminates if they are preceded by prefixes, but with single consonants if no prefixes are present. It was argued that Pāli initial geminates must be posited synchronically as *C+r* clusters, even though some *CC's* are historically from *Cl*, *Cy* or *Cv*. It was shown that a synchronic description of Skt. becomes much simpler if an underlying consonant is posited which does not appear in surface forms. As was discussed, Pāli has inherited several rules from Skt. The forms of those rules were compared with their original Skt. forms. It was found that all the Skt. rules have been generalized with the exception of one rule, Prefix Vowel Nasalization, which seemed to have been particularized.

Following are the findings and conclusions:

(1) A global constraint is needed to insure that every language producing intermediate forms which are as unnatural as some of those in Pāli will eliminate the most unnatural qualities of those forms. This constraint, based on the study of Pāli, has universal application.

(2) Some readjustment rules must be interspersed among phonological rules. According to SPE, readjustment rules precede all phonological rules.

(3) The study of diachronic vs. synchronic order in Pāli suggests the following principle. Phonological rules may be added to a grammar in two places : (1) at the end of phonological component, and (2) before a low-level phonetic rule.

(4) Phonological universals have been suggested on the basis of Pāli assimilatory processes in comparison with total assimilation in other languages, particularly Italian.

(5) It has been suggested that intervocalic *m* plus *h* and *n* plus *h* are geminate aspirates, *mmh* and *nnh* respectively.

(6) Most often, rules are generalized in the process of development, but they may occasionally become particularized.

(7) Generally, the development of morphology is in accord with morphological universals. When a distinction between two cases in the singular is obliterated by a phonological process, the distinction between the same two cases in the plural is also obliterated but not necessarily vice versa.

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